A CRITICAL EXAMINATION AND EVALUATION OF THE PLACE OF SCIENCE IN THE IRISH TRANSITION YEAR

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ABSTRACT

An Examination and Evaluation of the Place of Science in the Irish Transition Year

The Transition Year is a unique year in the Irish education system, which has undergone much change since it started in 1974/5, and is now a well established part of Irish schools, being offered by three-quarters of schools, and taken by over half of the pupils. The Transition Year is a syllabus-free year, governed by some broad guidelines, unlike the Irish school system as a whole, which is highly standardised and examined. As a small country within the European Union, Ireland is well placed as a base for many Science-based industries and Science and Technology have become a major focus of government policy, and hence Science education is becoming increasingly important in Ireland. Like other developed nations Ireland is experiencing low numbers taking the Physical Sciences, but has disproportionately high numbers taking the Biological Sciences. The unique nature of the Transition Year offers schools and teachers an unprecedented opportunity to offer a relevant, interesting and innovative Science programme, free from examination and curricular constraints.

The purpose of this study was to examine and evaluate the place of Science in the Transition Year. The study consisted of three phases. Phase 1 involved developing a questionnaire to find out what teachers were teaching in their Transition Year Science classroom, and how they were teaching it. This instrument gave a valuable insight into the practices and experiences of Transition Year Science teachers. Phase 2 expanded further on Phase 1 and developed questionnaires to examine the experiences of second level pupils and teachers, and third level students. These instruments provided the quantitative data for this study. Given the complex nature of the Transition Year, quantitative data alone was not enough for a complete view of Science and a Phase 3 was developed alongside Phase 2. Phase 3 used Case Studies in selected Transition Year schools to investigate further the place of Science in schools that offered the year. The Case Studies involved interviews with both Transition Year Science teachers and Co-ordinators, and data collection on the schools.

The results from the three phases have painted an interesting and complex picture of Science within the Transition Year. Themes emerged in the areas of Science provision, teaching and learning practices, attitudes towards and experiences of Transition Year Science, teachers’ preparedness for teaching in the year, the effect of Transition Year on further study of Science, and whole school planning and budget. These themes have been discussed fully and combined to offer a greater insight into the complexities of Transition Year Science. The overall picture is one of traditional and conservative teaching practices. The Transition Year presents a unique opportunity to educators: to be innovative, to teach without the constraints of the curriculum, and to develop and prepare both future scientists and scientifically literate citizens. These approaches are currently not commonplace in Transition Year Science, where traditional practices are predominant, with two-thirds of teachers teaching from the Leaving Certificate Science syllabi. This study has shown that the curricular freedom that the Transition Year offers in Science is not being utilised and thus remains a wasted opportunity to promote the teaching and learning of Science.
DECLARATION

This thesis is presented in fulfilment of the requirements for the degree of Doctorate of Philosophy. It is entirely my own work and has not been submitted to any other University, Institution of Higher Education, or for any other academic award in this University. Where use has been made of the work of other people it has been fully acknowledged and fully referenced.

Signature: _______________________

Sarah Hayes

November 2011
DEDICATION

I would like to dedicate this dissertation to my family, in particular my parents (Anne and Eugene) and my sister Emma. Thank you all so much for your unwavering support, encouragement and patience with me throughout this journey.
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<td>ASTI</td>
<td>Association of Secondary School Teachers of Ireland</td>
</tr>
<tr>
<td>CAO</td>
<td>Central Applications Office</td>
</tr>
<tr>
<td>CASE</td>
<td>Cognitive Acceleration through Science Education</td>
</tr>
<tr>
<td>CEB</td>
<td>Curriculum and Examinations Board</td>
</tr>
<tr>
<td>CPD</td>
<td>Continuous Professional Development</td>
</tr>
<tr>
<td>DES</td>
<td>Department of Education and Science or Department of Education and Skills (Depending on the year)</td>
</tr>
<tr>
<td>ESRI</td>
<td>Economic and Social Research Institute</td>
</tr>
<tr>
<td>$F$ or $\chi^2_i$</td>
<td>F-ratio (used in ANOVA)</td>
</tr>
<tr>
<td>FYP</td>
<td>Final Year Project</td>
</tr>
<tr>
<td>GNP</td>
<td>Gross National Product</td>
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<tr>
<td>H</td>
<td>Kruskal Wallis test statistic</td>
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<tr>
<td>HEA</td>
<td>Higher Education Authority</td>
</tr>
<tr>
<td>IBEC</td>
<td>Irish Business and Employers Confederation</td>
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<tr>
<td>ISTA</td>
<td>Irish Science Teachers Association</td>
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<tr>
<td>JC</td>
<td>Junior Certificate</td>
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<tr>
<td>LC</td>
<td>Leaving Certificate</td>
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<tr>
<td>LCA</td>
<td>Leaving Certificate Applied</td>
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<tr>
<td>M</td>
<td>Mean</td>
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<tr>
<td>Mdn</td>
<td>Median</td>
</tr>
<tr>
<td>N</td>
<td>The total sample size</td>
</tr>
<tr>
<td>N</td>
<td>The size of a particular group, i.e. the number of respondents to a particular question</td>
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<tr>
<td>NCCA</td>
<td>National Council for Curriculum and Assessment</td>
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<tr>
<td>NGO</td>
<td>Non-Governmental Organisation</td>
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<tr>
<td>Abbreviation</td>
<td>Full Form</td>
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<tr>
<td>OECD</td>
<td>Organisation for Economic Co-operation and Development</td>
</tr>
<tr>
<td>P</td>
<td>Probability (the probability value or significance of a test)</td>
</tr>
<tr>
<td>PASW</td>
<td>Predictive</td>
</tr>
<tr>
<td>PD</td>
<td>Professional Development</td>
</tr>
<tr>
<td>PDST</td>
<td>Professional Development Service for Teachers (formerly SLSS)</td>
</tr>
<tr>
<td>PISA</td>
<td>Programme for International Student Assessment</td>
</tr>
<tr>
<td>SE</td>
<td>Standard Error</td>
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<tr>
<td>SLSS</td>
<td>Second Level Support Service</td>
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<tr>
<td>SPSS</td>
<td>Statistical Package for the Social Sciences</td>
</tr>
<tr>
<td>SEC</td>
<td>State Examinations Commission</td>
</tr>
<tr>
<td>STS</td>
<td>Science, Technology and Society</td>
</tr>
<tr>
<td>T</td>
<td>Test statistic for a t-test</td>
</tr>
<tr>
<td>TALIS</td>
<td>Teaching and Learning International Study</td>
</tr>
<tr>
<td>TIMMS</td>
<td>Trends in International Mathematics and Science Study</td>
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<tr>
<td>TU</td>
<td>Transition Unit</td>
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<tr>
<td>TY</td>
<td>Transition Year</td>
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<tr>
<td>TYCSS</td>
<td>Transition Year Curriculum Support Service</td>
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<tr>
<td>TYO</td>
<td>Transition Year Option</td>
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<td>TYP</td>
<td>Transition Year Programme</td>
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<td>TYST</td>
<td>Transition Year Support Team</td>
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<tr>
<td>U</td>
<td>Mann Whitney test statistic</td>
</tr>
<tr>
<td>UL</td>
<td>University of Limerick</td>
</tr>
<tr>
<td>ULREC</td>
<td>University of Limerick Research Ethics Committee</td>
</tr>
<tr>
<td>$\chi^2$</td>
<td>Chi-square test statistic</td>
</tr>
</tbody>
</table>
### Definition of Terms Used Throughout the Research

<table>
<thead>
<tr>
<th>Term</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Allocation:</td>
<td>The manner in which subjects are offered/made available to pupils, or the criteria that pupils must satisfy in order to be permitted to choose a particular subject within a school.</td>
</tr>
<tr>
<td>Attitude:</td>
<td>There is no single agreed definition of attitude. It can be a positive, negative or neutral response to a situation, concept, person or idea which determines behaviour towards opinions or beliefs.</td>
</tr>
<tr>
<td>Case Study:</td>
<td>The investigation of a specific instance, or bounded system, which is frequently designed to illustrate a more general principle, and is the study of action.</td>
</tr>
<tr>
<td>Enrolments:</td>
<td>The number of pupils/students who have taken a particular subject/year/examination.</td>
</tr>
<tr>
<td>Fee-paying school:</td>
<td>Classification of post-primary (second level) schools who charge fees to its pupils for attendance.</td>
</tr>
<tr>
<td>Grind school:</td>
<td>Type of post-primary (second level) school with a strict emphasis on examination results and focus on teaching towards the examination, which</td>
</tr>
<tr>
<td>Definition of Terms Used Throughout the Research</td>
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<td>------------------------------------------------</td>
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<tr>
<td>In-service courses:</td>
<td></td>
</tr>
<tr>
<td>Training and professional development courses offered to teachers in the Irish education system, to update their knowledge and skills.</td>
<td></td>
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<tr>
<td>Junior Certificate Examination:</td>
<td></td>
</tr>
<tr>
<td>A terminal examination for the three year Junior cycle programme in the post-primary (second level) education system. This examination is usually sat by pupils aged 14-15, after completing the first three years of their post primary education. The examination comprises of individual examinations for each individual subject, of which science is one subject. Subjects may be offered at Higher or Ordinary level (and Foundation level for the core subjects: English, Irish and Mathematics).</td>
<td></td>
</tr>
<tr>
<td>Junior Cycle:</td>
<td></td>
</tr>
<tr>
<td>The first three years of post-primary (second level) education system. This cycle concludes with an examination known as the Junior Certificate.</td>
<td></td>
</tr>
<tr>
<td>Leaving Certificate Examination:</td>
<td></td>
</tr>
<tr>
<td>This is the final examination in the post-primary education system, without which an individual cannot progress onto third level education. The examination takes place at the end of the two year senior cycle and pupils are typically aged 17 – 18 when taking it. The examination is composed of individual examinations for</td>
<td></td>
</tr>
<tr>
<td>Term</td>
<td>Definition</td>
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</tr>
<tr>
<td>Primary Education</td>
<td>This is the first stage of the Irish education system. This typically begins when pupils are aged 4-5 years. It is of eight years duration, beginning with two initial years (Junior and Senior Infants) followed by classes 1 – 6. Pupils complete their primary education aged 12-13. During this stage of the child’s education a broad curriculum is covered. Areas such as languages, mathematics, arts (visual arts, music and drama), social, environmental and scientific education, physical education and social personal and health education are covered. Science was only formally introduced to the primary curriculum in 2003.</td>
</tr>
<tr>
<td>Provision</td>
<td>This term describes whether or not a particular subject is offered within a school curriculum.</td>
</tr>
<tr>
<td>Pupil</td>
<td>Describes individuals in primary or post-primary (second level) education.</td>
</tr>
<tr>
<td>School gender</td>
<td>Classification of post-primary (second level) schools according to the gender</td>
</tr>
<tr>
<td>Term</td>
<td>Definition</td>
</tr>
<tr>
<td>-------------------------------------------</td>
<td>------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>School type:</td>
<td>Classification of post-primary (second level) schools according to the management structure of the school, e.g. secondary school, community/comprehensive school, vocational school.</td>
</tr>
<tr>
<td>Science:</td>
<td>This may be taken to represent the Junior Certificate science course, which includes the three main science subjects; physics, chemistry, biology.</td>
</tr>
<tr>
<td>Scientific Literacy:</td>
<td>An individual’s scientific knowledge, and use of that knowledge, to identify questions, acquire new knowledge, explain scientific phenomena and draw evidence-based conclusions about science-related issues; their understanding of the characteristic features of science as a form of human knowledge and enquiry; their awareness of how science and technology shape our material, intellectual and cultural environments; and their willingness to engage in science-related issues, and with the ideas of science, as a reflective citizen.</td>
</tr>
<tr>
<td>Second level education:</td>
<td>The next stage of the Irish education system after primary education. Pupils enter their second level (post primary) education aged 12-13, and leave aged 17-</td>
</tr>
</tbody>
</table>

Composition of the pupils, e.g. all boys, all girls, coeducational/mixed school.
18. It is a five year system, consisting of two cycles, the Junior cycles and the Senior cycle, with an optional sixth year between the two cycles of the system (the Transition Year). Education is compulsory to age fifteen.

<table>
<thead>
<tr>
<th>Senior Cycle:</th>
<th>The final two year cycle of the post-primary school system. This cycle culminates if a terminal examination, the Leaving Certificate.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student:</td>
<td>Describes an individual in third level education.</td>
</tr>
<tr>
<td>Transition Year or Transition Year Programme:</td>
<td>An optional one year programme which may be offered by schools to pupils after they have completed their junior cycle, prior to entering the senior cycle. If offered pupils are not obliged to take it, unless the individual school has made the year compulsory for its pupils.</td>
</tr>
</tbody>
</table>
CHAPTER 1: INTRODUCTION
1.1 Introduction

This chapter is designed to give an overview of the thesis, outlining why the study was undertaken, the importance of the research, what the author has set out to achieve and how this was carried out. The background to the research and the rationale for undertaking the study will be presented, and the research methodology will be summarised.

1.2 Background to the Research and Rationale

1.2.1 The Transition Year Programme

The Transition Year is an optional one year programme offered to pupils after they have completed their Junior Certificate, but before they enter the next examinable stage (5th and 6th Year – Leaving Certificate cycle) of their second level education. The mission of Transition Year is “To promote the personal, social, educational and vocational development of pupils and to prepare them for their role as autonomous, participative, and responsible members of society” (Department of Education 1993c, p. 1). The year is designed to act as a bridging year between the two examinable cycles of second level education (See Figure 1.1). It was designed to enable pupils to move away from the highly structured, formally examinable education programme which prevails throughout the Irish schools system (Smyth et al. 2007, Jeffers 2011). To further clarify, the Transition Year aims to provide “a bridge to enable students to make the transition from a highly-structured environment to one where they will take greater responsibility for their own learning and decision making” (Department of Education 1993c). The programme itself varies from school to school. Each school has the autonomy to chose and design their own timetable and programme in order to cater for the needs of their own students. This must be done in accordance with the TY guidelines and will vary depending on each school’s resources. However, a whole school approach is recommended (Department of Education 1993c, ScoilNet 1999, Smyth et al. 2004).
1.2.2 Science in Ireland

The uptake of Science in Ireland has been on the national agenda for many years, since the noticeable drop-off of pupils taking Science subjects in the nineteen-eighties. This national focus has been concentrated particularly on the uptake of the Physical Sciences. It has been argued that as a nation we need more pupils and students taking the Science and Technology subjects, in order to widen the pool from which we draw our workforce (Department of Education and Science 2006, Department of Enterprise Trade and Employment 2006, Condon and McNaboe 2009, Childs 2010c, Engineers Ireland 2010, Department of Education and Skills 2011a).
However, currently there are relatively high numbers taking Science degrees at third level (National Competitiveness Council 2010). The Royal Irish Academy (2009) noted that undergraduate Science courses accounted for 13% of all undergraduate enrolments, with universities accounting for 60% of these. The numbers currently taking undergraduate Science courses are sufficient, but the pool of educated graduates from which we draw our workforce is still limited. The Irish Governments’ focus on enlarging the supply of Science, Engineering and Technology graduates has failed to take account of the quality of the graduates. This is a core reason why the low numbers of pupils taking the Physical Science subjects at second level is so worrying. Currently entry into most third level Science degree programmes does not require students to have studied a relevant Science subject at second level. This is resulting in students taking degrees involving Physics and Chemistry with little to no prior knowledge of the subject upon entry to the course (Regan et al. 2011). Seery (2009, p. 227) noted that

“chemistry is taken by 10 – 15% of students in the senior cycle of school (Leaving Certificate) in Ireland, and therefore tertiary institutions cannot impose a prerequisite of chemistry for entry into chemistry based degrees because of the limited pool of potential applicants”.

The low numbers of pupils taking the Physical Sciences give rise to the fact that many students who go on to pursue a Science degree at third level are ill-equipped. The low level CAO points required for many undergraduate Science courses often attract insufficiently prepared pupils, and may deter many high achieving pupils who do not view a Science degree as a high status programme. This can lead to high levels of student attrition and issues with retention, with Science courses experiencing the highest levels of non-completion across Europe (Flanagan and Morgan 2004, Moore 2004).

In the Irish second level education system Science is not compulsory at any stage in the curriculum. This has definite social and economic implications which will be discussed further in the subsequent literature review chapters. Osborne et al. (2003, p. 1051) noted that “the nation’s standards of achievement and competiveness are based on a highly educated, well trained and adaptable workforce.” He also observed
that “the low uptake of mathematics and science and the negative attitudes towards these subjects poses a serious threat to economic prosperity”. Yet, “Ireland’s education system has played a key role in our economic transformation by equipping the Irish workforce with skills and qualifications that supported the growth of our internationally trading manufacturing and services sectors” (National Competitiveness Council 2008, p. 11).

The current economic situation has owed a lot to the scientific sector, whose exports currently provide well over half the gross national product. This sector, despite the recessionary climate, has remained relatively strong.

“Export figures for 2008 recently published by the Central Statistics Office (CSO) reveal that this sector [the pharmachemical sector] exported products to the value of €44.17 billion, which represents 51.2% of the national total.” (Moran 2009, p. 5).

Located in Ireland are 8 of the world’s 10 largest pharmaceutical companies, creating employment in the scientific sector (National Competitiveness Council 2008;2010). This has marked Ireland as a leader in Europe, in terms of science graduates and opportunities for employment in this sector. (Department of Education and Science 2002, Forfás 2009). In order to continue as leaders in the fields of Science and Technology and support a knowledge-based economy the place of Science in our education system needs to be addressed. Both pupil uptake and interest in Science needs to be examined.

The low numbers of students taking Science at second level, particularly in upper second level (senior cycle) Physics and Chemistry, has been cited as striking. ‘The drop-off in students taking science from junior to senior cycle at second level is dramatic” (Royal Irish Academy 2005, p. 5). The Task Force Report on the Physical Sciences found that:
“Two influences for low uptake of the physical sciences are the perception of the science subjects per se and the perception of science related careers. Many Leaving Certificate students say they did not choose physics or chemistry because of the difficulty of the subjects”

(Department of Education and Science 2002)

Student perception of science as a difficult, complicated or boring subject appears to be influencing its take-up at Leaving Certificate level. It was noted in the 2008 Forfás Annual Competitiveness Report that of 21 countries surveyed, only three countries allocated less time to teaching science than Ireland (National Competitiveness Council 2008).

1.3 Rationale for the study

The Irish education system is “highly standardised with nationally specified curricula and examinations at both Junior and Leaving Certificate levels” (Smyth et al. 2004, p. 7).

The Transition Year is considered to be particularly innovative in its emphasis on “personal development, self-directed learning and the absence of standardised assessment procedures” (Smyth et al. 2004, p. 1). The Transition Year provides a unique opportunity for teachers to teach Science in an imaginative and relevant way without the confines of a syllabus or an examination. It offers teachers the exciting prospect of changing students’ views of Science through teaching interesting and relevant material (Regan 2005). This unique year, between the junior and senior cycles has given rise to curriculum innovation in many subject areas including Science in an imaginative and innovative way. Previous interventions to utilise the year to promote the uptake of Science at senior cycle have been quite successful (Smith 1998, Smith and Matthews 2000, Sheehan 2004, Regan 2005, Hayes 2007, Murphy 2009, O'Dwyer 2009, Childs et al. 2010, Matthews 2010, McDonnell 2010, Ryan 2010). However, there has never been a large scale study conducted on the place of Science in the Transition Year, examining what is being done by both schools and teachers, and critically assessing the experiences of pupils, who take
Science, in this year. This research study found its origins in the results of another study. A pilot study, investigating the place of Transition Year Science, was completed in April 2007 (Lally 2007). The title of the study was ‘An investigation into what is being taught in Transition Year Science’ and it focused on 17 schools in the Galway region of Ireland. The study found that few teachers have laboratory time for all of their Science classes during Transition Year. Others mentioned that they were not aware of any Transition Year Science resources, while the majority of teachers surveyed were teaching from the Leaving Certificate Science course contrary to the Transition Year guidelines. It was also found that “their greatest concern was the lack of resources available” (Lally 2007).

These findings were used as a pilot for a more comprehensive study, whose findings are reported here. This study aims to evaluate critically the place of Science in the Transition Year, nationally, in order to allow for a more complete view of how the TY is being used, and whether it is achieving its objectives.

1.4 Purpose of the Research and Significance of the Study

This is the first study of its kind in Ireland. There has been a great deal of research conducted in both the area of Science education in an Irish context and on the Transition Year. However, this is the first study to examine and evaluate the place of Science within the Transition Year. This research provides a significant baseline study for the examination of Science within the year. It also adds to the understanding of how and why pupils choose Science and the key factors involved in this decision.

1.5 Overarching Considerations

The research study described in this dissertation was not conducted in a vacuum, and the author was aware of a number of influential factors which had a significant impact on this study. The author’s background must be taken into account as her view of Science education research is a synthesis of several elements involving her own education, training and work experience. The author is a qualified Physics and Chemistry teacher who did not take the Transition Year Programme during her
second level education. The author began the study with the perspective of a Science teacher, and her professional background and qualifications led to a distinctive perspective of the study, which influenced how she would conduct the research. The author’s first experiences of researching the Irish Transition Year were for her Final Year Project, which involved the creation and evaluation of a Transition Year Environmental Science module as part of a larger ‘TY Science’ curriculum project (Hayes 2007). This project stemmed from the realisation that many teachers were struggling to come up with an interesting and innovative science curriculum for their Transition Year pupils (Childs et al. 2010). It was at this time that the author realised that there was little to no information about Science in the Transition Year. This study has developed from the author’s own reflections and experiences of this problem and seeks to examine how Science is treated in the year. The author’s worldview and background has a bearing on the research, as it is the lens through which the author views the subject matter to be investigated. Therefore it also influences the author’s choice of methodological tools employed in the research and the theoretical stance taken.

During the first two years of this study the author was performing a ‘Science Magic’ road show for schools around the country. This show was aimed at pupils about to make their subject choices for Senior Cycle, namely third year and Transition Year pupils. This led the author to have a significant number of interactions with Science teachers and their pupils, at this stage in their second level career, and the issues encountered by these groups. This had an impact on the author’s concept of the study and the lens through which the research was viewed, particularly during the design phases of the study. Also, from the second year of this study onwards the author was working for the National Centre for Excellence in Mathematics and Science Teaching and Learning (NCE-MSTL) at the University of Limerick. This working environment influenced the author’s work, as it involved the author becoming heavily involved in many Science education research projects and in-service training courses. In this sense, the author was immersed in Science education research and training, while still maintaining a considerable amount of contact with schools and Science teachers.
1.6 Research Aims and Questions

The central aim to this research was ‘to examine and evaluate the place of Science in the Irish Transition Year’. The author believed that in order to realise this goal the study had to examine the place of Science in the Transition Year from a variety of perspectives, taking into account the key figures invested in the subject in the year. This led to the development of three key research questions:

- What are the pupils’ experiences of Transition Year Science?
- How is Transition Year Science organised and perceived within schools?
- How do Science teachers utilise the Transition Year to teach Science?

In order to fully answer these research questions and focus the study, nine subsidiary questions were formulated. These subsidiary questions are:

- What are pupils’ attitudes towards Transition Year Science?
- What are pupils’ experiences of making subject choice decisions for Senior Cycle? Where do they get their information from and what type of information/advice do they receive?
- How do Transition Year pupils’ experiences of Science differ from Junior Certificate pupils’ experience of the subject?
- Why do pupils who choose to take Science at Senior Cycle choose to do so? What impact, if any does taking Transition Year Science have on these decisions?
- Are there any factors that impact on how Science teachers teach Transition Year Science?
- What do Transition Year science teachers teach in their Transition Year Science classes? What is their rationale for teaching the content that they teach and how is it taught?
- Do schools display differences in how they provide Science both in the Transition Year, and subsequently at senior cycle?
- How is Transition Year Science treated and perceived within schools?
1.7 Research Methodology

A mixed-method approach was employed throughout this study. This allowed for the collection of both qualitative and quantitative data, providing a more complete view of the place of Science in the Transition Year. This approach is described more fully in chapter four.

This research was structured in three phases, as indicated in Figure 1.2 below.

![Diagram illustrating the three phases of research](image)

**Figure 1.2: Outline of the phases of research.**

1.8 Delimitations and Limitations of the Study

The delimitations of the study are the factors controlled by the author. The main factors in this research are the choice of the main and subsidiary research questions. These issues were chosen due to the author’s background and worldview, and the author recognises that other interpretations of the central aim of the study are
possible, but are not pursued in this research. The mixed-method approach taken in this study invariably generated a vast amount of data. This issue led the author to make very specific decisions about what data to include in the final thesis, ultimately resulting in a conflict between breadth versus depth in the analysis of data. Decisions regarding this were made using the author’s expert knowledge of the study and keeping the central argument of the research in mind.

The limitations of this study are the factors which could not be controlled by the author. The main limitation of this study was the poor response rate to the initial teacher survey; in Phase 1, although this was allowed for in the subsequent phases of the study as discussed in chapter four.

Schools chosen to participate in the research are also recognised as being both a factor controlled by the author, and also one which the author had little control over. Schools offering the Transition Year were chosen to be surveyed from a Department of Education and Science schools list. This was due to the study setting out to specifically capture data from teachers and pupils, who were involved in Science in the Transition Year. The research originally hoped to focus the case study on all types of schools offering the Transition Year, but due to the reluctance of certain schools to participate in the study the author adapted the research to include specific schools in the case studies. This is discussed further in chapter four. The author believes that this is compensated for by the richness and variety of the data produced in the study.

1.9 Structure of the thesis

Chapter 2
This is the first of two literature review chapters, and provides a comprehensive discussion of the origins of the Transition Year to its present day inception and its place within the Irish second level school system. The role of Science in the year, the purpose of schooling and teachers continuous professional development (CPD) is also addressed within this chapter.

Chapter 3

The second literature review chapter considers the place of science, both in the Irish context and internationally. Comparisons are drawn between the Irish system and other relevant ones. Attitudes to science are examined and the key factors that determine the uptake of science subjects are explored.
Chapter 4
This chapter provides a detailed description of the research design employed in this study. It offers a rationale for the theoretical position taken and the research design employed in this study. Each stage of the research process is discussed in detail, and the procedural issues encountered are addressed.

Chapter 5
This chapter is the first of three results chapters and offers an analysis of pupil experiences, both past and current, of Transition Year Science. Results from Transition Year Science and Junior Certificate Science pupils and third level students are drawn together to determine the experiences encountered and the effects of taking Transition Year Science.

Chapter 6
This chapter is the second of the three results chapters, and provides a comprehensive analysis of both the quantitative and the qualitative data produced through the Science teacher surveys and interviews.

Chapter 7
The final results chapter draws together information from case studies, interviews, and surveys to present an examination and analysis of the place of Transition Year Science in the Irish school system.

Chapter 8
This discussion chapter is a synthesis and analysis of the three results chapters. Elements of the three chapters are brought together and discussed in the context of the research questions.

Chapter 9
The final chapter summarises the main conclusions of the study. The author discusses the research contributions that the study has made. Recommendations are presented, based on the research findings, and suggestions for future work stemming from this area are proposed.
Appendices
All Appendices are presented in a CD ROM attached to the thesis, due to the size of the thesis.
CHAPTER 2: SETTING THE CONTEXT
2.1 Introduction

This chapter outlines the development of the Transition Year Programme, from its inception to its current day. An educational innovation such as the Transition Year must be viewed in terms of its development, its place in the Irish schools system, and the effects and implications of the year on schools, particularly in terms of continuous professional development (CPD), school culture, curriculum innovation and schools’ resistance to change.

2.2 The Irish Education System

The Irish Education System is composed of three basic levels; Primary (first level) education, second level (secondary, post-primary) education and higher education. Education at all of these levels is free for all and provided by the state. Education is compulsory for all children from the age of 6–16, or until the child has completed at least three years of second level education. Ireland is unusual, in that a large number of post-primary schools are still single-sex schools. Co-educational schooling has been a more recent trend. Figure 2.1 gives a more detailed outline of the Irish education system.
Figure 2.1: The structure of the Irish Education System (Department of Education and Science 2004)
2.2.1 Primary Education

Although it is not compulsory for children to begin their Primary education until the age of six, the majority of children are enrolled between the ages of four and five. Primary education is an eight year programme, with pupils beginning in two infant classes, junior and senior, which are the kindergarten years. The children then move on to years 1-6. There are three types of primary schools: state funded schools, special schools for children whose educational needs may not be met in mainstream schooling, and private schools. Within the sector of state funded schools there are religious schools, non-denominational schools, multi-denominational schools and Gaelscoileanna (Irish speaking schools). The majority of primary schools are still under religious control, although this is a matter of current debate.

2.2.2 Second level Education

Second level education can consist of a five or six year programme: a three year junior cycle, an optional one year Transition Year Programme and a two year senior cycle. There are a variety of second level school types: these include voluntary secondary schools (which may or may not be fee paying), vocational schools, community and comprehensive schools. The most prevalent type of school is the secondary school, which is a throwback to Ireland’s strong ties with the Catholic Church, as these were traditionally private schools run by religious orders. The next most common type of school is the Vocational school, which were founded in the nineteen thirties, and are usually run by regional Vocational Education Committees. These schools were traditionally less academic than secondary schools, but now offer a full range of subjects. Community and Comprehensive schools are the most recent entrants (established in the nineteen sixties) into the Irish second level school system and offer a variety of practical, vocational and academic subjects. Subjects can be taken at two levels at second level: higher (honours) and lower (ordinary or pass). There is one other level available, called the foundation level, but this is only offered in the ‘core’ curriculum subjects of English, Irish and Mathematics. There is an initial three year junior cycle which all pupils take, and this cycle culminates in a terminal examination called the Junior Certificate. The Junior Certificate encompasses all of the subjects taken by the pupils, with pupils typically
sitting an examination paper in each subject. The junior cycle typically caters for pupils aged twelve to fifteen years. A wide variety of subjects can be taken, with no restrictions on the number of subjects a pupil can sit in the Junior Certificate. However, a number of subjects are core within the curriculum and must be taken. These are: English, Irish, Mathematics, Civic Social and Political Education (CSPE) and Social, Personal and Health Education. Science is not a core subject at this level. Two additional subjects must also be taken, but pupils often take up to seven or eight more subjects. There is also an alternative Junior Certificate School Programme, which may be taken by pupils who are from disadvantaged backgrounds and who are at risk of dropping out of school early.

The second phase of the second level education system is the Transition Year, which is an optional one year programme. The year is optional in the sense that schools are not obliged to offer the programme, and if offered pupils are not obliged to take it. The programme will be discussed in further detail as this chapter progresses.

The final cycle of second level education is referred to as the senior cycle. This is a two year programme consisting of three routes for pupils to take: The Leaving Certificate Applied, Leaving Certificate Vocational Programme or the Leaving Certificate Established. The Leaving Certificate Applied is designed for pupils who do not wish to proceed directly to Higher education, and has an emphasis on vocational preparation and preparation for work. The Leaving Certificate Vocational Programme is similar to the more traditional Leaving Certificate Established, but has more of a focus on preparation for working life and enterprise. Pupils can enter Higher education through this route. Finally the Leaving Certificate Established is the most traditional programme and the most commonly taken one. This programme culminates in a terminal examination, similar in style to the Junior Certificate. The majority of pupils in this programme take English, Irish and Mathematics as core subjects for their Leaving Certificate, and an additional three to five subjects. English, Irish and Mathematics are necessary for entry into most further education courses.
2.2.3 Higher Education

Higher education can be obtained through a variety of routes as illustrated in Figure 2.1. The traditional form of higher education is provided through the Universities and Institutes of Technology. There are seven Universities in Ireland and fourteen Institutes of Technology all which provide degrees at bachelor, master’s and doctoral level. Entrance into these institutions is decided through a points system. The pupils’ results (grades) in the Leaving Certificate examination are converted into numerical points, of which the scores from the six highest subjects are added together to give an overall score. This system is explained in more detail in section 2.3.4. Ireland has one of the highest global participation rates in higher education (Cheney 2006, Condon and McNaboe 2009, Department of Education and Skills 2011b).

2.3 Uptake of Science in Ireland

The main factors influencing pupils in their “subject choice for Leaving Certificate are: personal interest, personal ability and, perceived need of the subject in terms of college course or career” (Department of Education and Science 2002, p. 49)

“Thus, students are more likely to take science subjects if they find them interesting and useful and if they do well in science and are less likely to take the subjects if they find science difficult. However, this study indicates that a focus on individual student attitudes is not sufficient to explain variation in take-up patterns since important differences are found between schools in the proportion of students taking science subjects at upper secondary level.”

(Smyth and Hannan 2006, pp. 320-321)

However, it is uncertain how well these goals have been met. The Association of Secondary Teachers Ireland (2010, p. 5) has found that 14% of schools were planning to remove Science subjects from their timetables, due to economic constraints. Within these schools the main casualties are Physics and Chemistry, with teachers stating that it was not economically feasible to continue to offer these subjects given their poor uptake by pupils. This study also found that higher and ordinary level Science classes were amalgamated in over 70% of schools, in both
junior and senior cycle classes (Association of Secondary Teachers Ireland 2010, p. 14), even though it is desirable that they be taught separately.

2.3.1 Primary Science

Science became formalised in the Irish primary school curriculum in 1999. It is set in the context of Social Environmental and Scientific Education (SESE) along with History and Geography (Palmer 2001). It was made compulsory for all primary school pupils in 2003, and the first cohort of pupils to have a full six years of primary Science entered second level education in the school year 2009-10. Therefore, the full effect of this initiative has not yet been measured, particularly at international level through PISA. It is expected that the introduction of Science for primary pupils would have an effect on their overall understanding of Science, and preparation for second level pupils.

2.3.2 Junior Certificate Science

Science is widely provided by schools in the Junior Cycle, but is not compulsory in second level schools. The manner in which the subject is provided varies widely from school to school. Almost all “schools differ in how they provide Science with 60 per cent of the sampled schools making the subject compulsory for all students” (Smyth and Hannan 2002, p. 23).

Figure 2.2 below indicates the uptake of Junior Certificate Science over the last 10 years.
In some schools Science may be a compulsory part of the core curriculum and taken by all students. Other schools offer Science as a taster course in the first term of first year, and then allow their pupils to choose whether or not they want to continue with the subject. Finally, some schools offer it as an optional subject and pupils must choose their subjects soon after, if not before entering second level education. Often whether a pupil chooses Science with this option depends on their previous exposure to and experiences of Science.

A new revised Junior Certificate Science syllabus was introduced in March 2003, and first examined in 2006. The syllabus was revised in order to make Science more attractive, relevant and interesting to pupils. The 2002 Task Force Report on the Physical Sciences (p. 48) noted that “in first year, 83% of the cohort indicate that they will either “definitely” or “probably” continue to study science” but unfortunately by the time pupils have completed or neared the end of their Junior Cycle education their “interest has declined to the extent that only 39% of the cohort indicate that they will continue to study science”. A new practical component of
assessment was introduced, with pupils having to complete course work in the form of mandatory experiments and pupil investigations. The NCCA’s (2006, p. 7) Teacher Guidelines for Junior Certificate Science state that:

“the revised syllabus places student learning in the context of science activities, emphasising hands-on engagement through which the students can develop their understanding of the scientific concepts and principles involved, together with appropriate science process skills.”

The guidelines also state that “Arising out of their experience in the junior cycle, it is hoped that many students will be encouraged to study one or more of the science subjects in the senior cycle”

When this new syllabus was first examined in 2006, the assessment was quite different to its predecessor. The marks were allocated for the coursework (35% of the marks) and an examination paper (65% of the marks). The coursework is common to both higher and ordinary level; it is the examination papers that differ. The coursework is divided into two separate sections: coursework A and coursework B, which are allocated 10% and 25% of the marks, respectively. Coursework A involves the carrying out and recording of the thirty mandatory student activities which are identified in the syllabus. In Coursework B, candidates are required to submit a report of either two separate investigations selected from three nominated each year by the State Examinations Commission or of a single investigation of the pupils’ own choosing, which meets set criteria (National Council for Curriculum and Assessment 2009).

The previous Junior Certificate Science syllabus was examined for the final time in 2008, with only 0.5% of the total Junior Certificate Science cohort being examined at that time, the old and the new syllabi being run in parallel for those years. There has been little difference in the PISA results for Irish pupils in the area of Scientific Literacy over the years (2000, 2003, 2006, 2009), indicating that perhaps the new Junior Certificate Science syllabus has not had a significant impact on pupils’ levels of scientific literacy (Eivers et al. 2007).
The above graph (Figure 2.3) gives a clear indication of pupils’ grades since the introduction of the new Junior Certificate Science programme. The number of pupils receiving higher grades has decreased slightly, but so too have the higher levels of failures and E and D grades. The State Examinations response to the decrease in higher grades was that “It is generally recognised that the introduction of additional components in assessment tends to reduce the proportion of extreme grades awarded” (State Examinations Commission 2006, p. 6). The uptake of Science at Junior Certificate has increased since the introduction of the new syllabus, while pupils’ overall grades have become slightly more normal, with fewer extremes at the top and bottom level.

### 2.3.3 Leaving Certificate Science

Currently, at senior cycle, five Science subjects are offered. These subjects are Physics, Chemistry, Biology, Physics & Chemistry and Agricultural Science. Schools are encouraged to offer as many of these Science subjects as possible. However, a drop of 12% in the number of schools offering the combined subject

![Figure 2.3: Performance of candidates in Junior Certificate Science (Figures attained from the State Examinations Commission)](image-url)
Physics & Chemistry occurred in the 1990s. A large number of schools (97.8%) provide Biology for Senior Cycle, but only 75.9% of schools provide Physics and 78.6% provide Chemistry (Department of Education and Skills 2010).

<table>
<thead>
<tr>
<th>Subject</th>
<th>Percentage provision</th>
</tr>
</thead>
<tbody>
<tr>
<td>Junior Certificate Science</td>
<td>99.7%</td>
</tr>
<tr>
<td>Biology</td>
<td>97.8%</td>
</tr>
<tr>
<td>Chemistry</td>
<td>78.6%</td>
</tr>
<tr>
<td>Physics</td>
<td>75.9%</td>
</tr>
</tbody>
</table>

While, as previously mentioned, there is a high level of pupil enrolment in Junior Certificate Science, but there is a significant drop-off in Science uptake as pupils progress from their junior cycle to their senior cycle education. Figure 2.4 below indicates the current state of uptake of Science in Ireland.

![Figure 2.4: Uptake of Science in Ireland](image)

Figure 2.4 above illustrates the disparity between the numbers of pupils taking the Science subjects at senior cycle. The numbers taking Science have improved
marginally over the last 10 years. All Science subjects, excluding Physics and Physics & Chemistry, have gained pupils. For the first time in 10 years Chemistry has now surpassed Physics, albeit marginally. Biology continues to be the dominant Science subject at Leaving Certificate level with 53.7% of the cohort taking the subject in 2010 (Childs 2010a) and it is the fifth most popular Leaving Certificate subject. Table 2.2 below shows these changes in greater detail, in relation to the changes in the Leaving Certificate cohort.

Table 2.2: Changes in the LC cohort and science subjects 2002-2010 (Childs 2010a, p. 24)

<table>
<thead>
<tr>
<th>Year</th>
<th>LC Cohort</th>
<th>Biology</th>
<th>%</th>
<th>Chemistry</th>
<th>%</th>
<th>Physics</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>2002</td>
<td>58,489</td>
<td>22064</td>
<td>37.7</td>
<td>6497</td>
<td>11.1</td>
<td>8651</td>
<td>14.8</td>
</tr>
<tr>
<td>2003</td>
<td>56229</td>
<td>22669</td>
<td>40.3</td>
<td>6698</td>
<td>11.9</td>
<td>8806</td>
<td>15.7</td>
</tr>
<tr>
<td>2004</td>
<td>55183</td>
<td>24027</td>
<td>43.5</td>
<td>7229</td>
<td>13.1</td>
<td>8152</td>
<td>14.8</td>
</tr>
<tr>
<td>2005</td>
<td>54069</td>
<td>25362</td>
<td>46.9</td>
<td>7366</td>
<td>13.6</td>
<td>7944</td>
<td>14.7</td>
</tr>
<tr>
<td>2006</td>
<td>50995</td>
<td>24885</td>
<td>48.8</td>
<td>7071</td>
<td>13.9</td>
<td>7335</td>
<td>14.4</td>
</tr>
<tr>
<td>2007</td>
<td>50870</td>
<td>25792</td>
<td>50.7</td>
<td>6926</td>
<td>13.6</td>
<td>7251</td>
<td>14.3</td>
</tr>
<tr>
<td>2008</td>
<td>52144</td>
<td>26607</td>
<td>51.0</td>
<td>7114</td>
<td>13.6</td>
<td>7112</td>
<td>13.6</td>
</tr>
<tr>
<td>2009</td>
<td>54196</td>
<td>28160</td>
<td>51.8</td>
<td>7403</td>
<td>13.7</td>
<td>6923</td>
<td>12.8</td>
</tr>
<tr>
<td>2010</td>
<td>54481</td>
<td>29249</td>
<td>53.7</td>
<td>7548</td>
<td>13.85</td>
<td>6745</td>
<td>12.4</td>
</tr>
</tbody>
</table>

* New Biology syllabus examined from 2004 onwards; new Physics and Chemistry syllabi examined from 2002.

The Leaving Certificate cohort has experienced an overall decrease, but trends indicate that the increases in numbers taking the examination are going to continue (Childs 2010a;b). Biology has experienced a relatively rapid increase in popularity, as has Agricultural Science (10.6% of Leaving Certificate took the subject in 2010, compared to 5.2% in 2002). Chemistry’s increased uptake has been a slower process; similarly the decline of Physics and Physics & Chemistry (1.7% of the Leaving Certificate took Physics & Chemistry in 2002, 0.78% of the cohort took the subject in 2010) has also been slow. It appears, despite the marginal increase in the number of pupils taking Chemistry, that the dominance of the Biological Sciences is continuing and Agricultural Science is likely to overtake Physics in the near future.
Further recent figures compiled by Childs (2010a;b) show a similar trend. Table 2.4 below indicates that Science subjects do not do favourably in terms of popularity. The only Leaving Certificate Science subject featured in the top ten subjects is Biology, which as has already been noted, is disproportionately more popular than all other Science subjects offered at Senior Cycle. The disparity in enrolment for the three main Science subjects is greater in Ireland than in many other countries (Risch 2010).

<table>
<thead>
<tr>
<th>Subject</th>
<th>Δ2009-2010</th>
<th>% change 2009-2010</th>
<th>Δ2008-2009</th>
<th>Δ2002-2010 (% change)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biology</td>
<td>+1,089</td>
<td>+3.9%</td>
<td>+1,553</td>
<td>+7,185 (32.6%)</td>
</tr>
<tr>
<td>Chemistry</td>
<td>+145</td>
<td>+2.0%</td>
<td>+289</td>
<td>+1,051 (+16.2%)</td>
</tr>
<tr>
<td>Physics</td>
<td>-178</td>
<td>-2.8%</td>
<td>-190</td>
<td>-1,906 (-22.0%)</td>
</tr>
<tr>
<td>Phys+Chem.</td>
<td>-84</td>
<td>-16.2%</td>
<td>-79</td>
<td>-450 (-55.1%)</td>
</tr>
<tr>
<td>Ag. Science</td>
<td>+515</td>
<td>+9.8%</td>
<td>+534</td>
<td>+2,381 (+100.2%)</td>
</tr>
</tbody>
</table>
Currently the NCCA is engaged in the review and revision of Leaving Certificate subjects, and their assessment, on an ongoing basis. In September 2000 revised syllabi were introduced in Chemistry, and Physics, and in Biology in 2002. These syllabi are now once again under review, and other subjects currently under review include Mathematics, Applied Mathematics, and Agricultural Science. Both Physics with Chemistry and Agricultural Science are long overdue for review, as the existing syllabi are over 40 years old. It was originally hoped that revised syllabi in the Physical Sciences would be introduced into schools in the year 2009/10 on a phased basis, having due regard to the implementation issues in schools. The current Physics, Chemistry and Biology syllabi were designed to characterise:

- modernisation and increased relevance,
- an outcomes-based approach to expressing course and assessment objectives,
- increased attention to the vocational aspects of subjects – to the application of learning to real-life situations,
- greater attention to differentiation, often in the form of different learning outcomes for Ordinary and Higher levels,
29

- broadening of the basis for and the methods for the assessment of achievement,
- greater consideration of gender issues and of special educational needs.

In addition to updating the content and relevance of syllabi, the vocational orientation of each subject, where relevant, has also been increased. Mandatory experiments have been specified for pupils, yet there is still no practical assessment of these experiments. Continuous Professional Development courses are provided by the Department of Education and Skills for teachers of all the revised syllabi (National Council for Curriculum and Assessment 2008a).

The newly developed syllabi for Physics, Chemistry and Biology are currently undergoing a consultation process with Science teachers and unions, and other relevant parties, with a deadline of October 28th 2011. It is currently unknown when these will be introduced. They include, for the first time, a proposal for formal assessment of practical work.

2.3.4 Third level Science

“Higher education in Ireland has long played a significant role in underpinning government policies to promote economic growth.” (Royal Irish Academy 2009, p. 3) The Irish government has long been advocating a “significant increase in the numbers of people with advanced qualifications in science and engineering”, as it is believed that Ireland needs these individuals to keep the economy competitive on a global platform (Department of Enterprise Trade and Employment 2006, p. 24). In an attempt to boost the knowledge economy and enhance the supply of graduates in science, mathematics, and engineering, the government has encouraged Universities and Institutes of Technology to increase substantially the number of undergraduate places in Science (Royal Irish Academy 2009). Undergraduate Science courses accounted for 13% of all undergraduate enrolments, with Universities accounting for 60% of these (Royal Irish Academy 2009). The percentage of students selecting Science courses went up by 14% in 2010 and 6% in 2011, therefore the work of the Irish government does appear to be paying dividends and, “Eurostat figures show that, as a percentage of all tertiary graduates, Ireland is one of the leading countries
in the EU in terms of science, mathematics and computing graduates. (Forfás 2009, p. 26). However, while there are sufficient number taking the Sciences at third level, the more pressing issue is are these students an embodiment of the quality of scientists that Ireland needs? In addition the perception among pupils and teachers that Science is a difficult subject, and is more difficult to achieve high grades in is not wholly unfounded. Kellaghan and Millar (2003) have discussed the discrepancy found between grades achieved in the Science subjects, in comparison to other school subjects, and found there to be significant differences.

Ireland has a two-tier third level system with Science courses being offered in both Universities and Institutes of Technology. Many Science courses at Universities start from 350 points upwards, depending on the particular course and the institution, with the equivalent courses starting from 205 points in Institutes of Technology. Courses with a higher demand, such as medicine, pharmacy and law, can start from over 500 points, with most needing over 550 points for entry. Science courses are less popular and attract weaker students on average than these professional courses (Childs 2010b). 2011 has shown a welcome increase in the number of points required for entry to Science courses, due to increase in demand.

Course entrance points are determined each year through a supply and demand system administered by the Central Applications Office. Essentially the points required are based upon the number of student places and the demand for these places. Therefore the number of points that one needs to be accepted into a third level degree programme does not necessarily reflect the difficulty of the course, rather, its popularity is related to the number of places. Points for entry into courses in third level institutions change from year to year depending on demand, so that in 2010, for example, points rose for most courses due to higher demand. The Leaving Certificate examination results, third level applications and offers of course places from the third level institutions are all processed through the Central Applications Office (CAO, www.cao.ie).
Significantly, this expansion in third level education has left us with a very diverse group of students in our lecture halls (Childs and Sheehan 2009, Darmody and Fleming 2009, Royal Irish Academy 2009, Hayes and Childs 2010, Regan et al. 2011). Zeegers and Martin (2001, p. 35) note,

“gone are the days when university classes contained only highly selected students, with present day classes now containing students with a more diverse range of academic skills, past teaching and learning experiences, prior knowledge, approaches to learning and expectations of the tertiary experience”.

Science courses at third level in Ireland are facing a particular problem. These courses, like others of their kind across Europe, experience a high level of attrition among students. Science and Mathematics courses across Europe have lower completion rates than other courses, such as Arts and Law. This is also true for Irish courses, with Science courses having significantly higher rates of attrition (22.2%) in comparison to courses such as Law (7.1%) (Flanagan and Morgan 2004, Moore 2004). A number of factors are involved in these low levels of completion. As mentioned previously there are low numbers of pupils taking the Physical Sciences and higher level Mathematics at school. This leads to many students who are ill-equipped and underprepared to take a Science course at third level. This is partly due to the fact that students who enter third level science courses are not always required to have taken a relevant Science subject for their Leaving Certificate. Seery (2009, p. 227) noted that “chemistry is taken by 10–15% of students in the senior cycle of school (Leaving Certificate) in Ireland, and therefore tertiary institutions cannot impose a prerequisite of chemistry for entry into chemistry based degrees because of the limited pool of potential applicants”. However, the students who have not taken a Physical Science subject at school do not have an adequate grounding in the basics of for study at third level, where Physics and Chemistry are often required courses in first year. In the early modules studied in these Science courses, these students without a Science background are often left behind (Hayes and Childs 2010, Regan et al. 2011). The current elevated uptake of Science courses at third level appears set to continue, as current high levels of unemployment lead to
demand for further re-training and up-skilling, and at the same time the population is on the increase. This all leads to further competition for third level places, and greater diversity of students in the traditional academic setting (Childs 2010b). Lyons (2006, p. 308) has suggested that

“changing external conditions, such as the decreasing strategic value of such courses as universities offer more flexible options, have only served to highlight the lack of intrinsic benefits of school science as conventionally taught. If this is indeed the case, instead of considering why clever students are no longer taking science courses, it may be more pertinent to ask, “Why should they?”.”

2.4 The Transition Year

Jeffers (2008, p. 5) discusses the recurring representation of the Transition Year as a “delicate flower in the educational garden. Initially the year was introduced as a ‘top-down’ initiative, with little planning and limited support for schools that were willing to participate in the year. The Transition Year has been characterised by uncertainty, from its initial inception, to the year in its current day form. This characterisation is both in terms of monetary provision and in terms of the attitudes of parents, teachers, pupils and policymakers towards the year (ibid).

2.4.1 Phases of Development

The development of the Transition Year has been, traditionally, characterised into stages or phases (Doyle et al. 1990, Humphreys 1996, Deane 1997, Boran 2002, Smyth 2004, Jeffers 2008). Typically the year has been viewed as a three phase endeavour; however, the author would argue that the Transition Year has now entered the fourth phase of its development.

2.4.1.1 Phase 1

The initial stage chronicles the first decade of the Transition Year, from its initial inception, to the mid 1980s. The Transition Year Programme was initially introduced
to Irish second level schools in 1973. In the school year (September – June) 1974/75 a pilot programme was launched by the then Minister of Education, Richard Burke. This programme was initially piloted by three schools and involved sixty six pupils. The following year after the pilot year, five more schools joined the initial three, and the year after that nine more joined. The Transition Year was at this stage a pursuit for a minority of schools, and viewed as an optional extra (Jeffers 2008). It was concerned with both the early school leaver, and pupils who planned to complete their Leaving Certificate but felt unready to do so immediately after the Junior Certificate (Association of Secondary Teachers Ireland 1992, p. 3). The core concept behind the idea arose due to:

“the growing pressures on students for high grades and competitive success, educational systems are becoming, increasingly, academic treadmills. Increasingly, too, because of these pressures the school is losing contact with life outside and the student has little or no opportunity ‘to stand and stare’, to discover the kind of person he [sic] is, the kind of society he will be living in and, in due course, contributing to, its shortcomings and its good points. The suggestion was made that perhaps somewhere in the middle of the course we might stop the treadmill and release the students from the educational pressures for one year so that they could devote time to personal development and community service.”

(Burke 1974)

The Minister, a former teacher,

“believed that the implementation of his proposal would depend on the imagination and professionalism of teachers. He expected them to drive and develop the idea, as, in his eyes, TY offered ‘an opportunity for the teaching profession to actually engage in education in the strictest sense of that term’”

(Burke 2001 cited in Jeffers 2008, p. 9)

The proposal to launch the Transition Year was a response to what the Minister viewed as major deficiencies in the school system. Mainly, that Education had
traditionally been designed for the élite, whereas, there was now a more diverse group of pupils entering education and remaining there. The question arose
“‘How then can schools effectively cater for pupils who come from every occupational group and class and who differ radically from each other – in environment, in ability, in motivation and in levels of expectation and aspiration. How best does one adapt to our current needs an academic curriculum designed for an able minority with special occupational requirements? Can we find, so to speak, a non-academic equivalent suitable to the needs of what is really a major portion of the pupils in our schools today?’”

(Dáil Éireann 1973)

The first formal reference to the Transition Year, as a part of the school system, was in the ‘Rules and Programmes for Secondary Schools in 1976.

**Rules and Programmes for Secondary Schools, 1976**

The rules and programmes stated:

1. The Transition Year Project is a one-year interdisciplinary programme for pupils who have completed an approved course for recognised Junior Cycle pupils.

2. The Project is directed towards the intellectual, social and emotional maturation of the pupil. It is conceived as an introduction to adult education and to *education permanente*. Transition Year curricula can therefore be designed to meet the needs of

   a) those for whom the Transition Year will represent the end of normal full-time schooling; and

   b) those who intend to follow approved courses for recognised senior pupils.

3. The content of Transition Year curricula will include elements of the following: social education; moral education; education for living (including homecrafts and education for parenthood, employment and leisure); philosophy and applied logic; music and the arts; ‘civilisation’ courses for students of continental European languages; visual education; media education and communication skills, etc. (Department of Education 1976)

A review of the Transition Year in this early stage was carried out by Egan and O’Reilly (1980). They noted in this review that there were confusing elements to the
year, in that it was for both the early school leaver, and the pupil who intended to complete their schooling (p. 49). There was a stronger lean towards the vocational and practical subjects, with some schools viewing the other ‘academic’ subjects receiving less emphasis (p. 55). Egan and O’Reilly compiled a list of 12 Transition Year themes, which were set out in order to identify the differences in emphases in the curricula (Jeffers 2008, p. 15). These themes were:

- Linear subjects: the traditional academic subjects.
- Philosophy and Logic: introduction to content and method of these disciplines.
- Pupil & Teacher relations: expanding traditional roles, to view each other as individuals.
- Social skills: providing pupils with confidence.
- Arts and humanities: in order to offset the academic bias of the curriculum.
- Transition to Work: preparation for the role of the working adult.
- New subjects: introduction to subject areas which otherwise would not be encountered.
- Self-analysis: formal effort to encourage reflection and self-assessment.
- Education for practical living: skills and knowledge utilised in everyday life.
- Education for leisure: imparting specific skills and interests for use of adult leisure time.
- Non-academic pupils: enabling non-academic pupils to feel that the school is a place for them too.

The impact of the year on both the pupils, and the whole school was reported for the first time at this early stage, with both pupils and teachers alike commenting that the year had a “definite impact on the climate of the school” and had improved pupils’ attitudes towards school (Egan and O’Reilly 1980, p. 58).

2.4.1.2 Phase 2

The second stage of development of the Transition Year began in the mid 1980’s, when the government decided to introduce a three year junior cycle for all pupils. The Intermediate and Group Certificate programmes were replaced by the Junior Certificate programme. This move away from the Intermediate and Group certificate,
left many schools who traditionally offered a four year junior cycle with a gap to fill. The Transition Year was viewed as a way in which to fill the gap, and thus maintain a six-year cycle (Jeffers 2008). In fee-paying schools, this was essential to maintain economic viability. In 1985, the Minister of Education, Gemma Hussey, reorganised the programme in the form of the ‘Transition Year Option’.

In October 1985 the Department of Education issued a circular letter inviting schools to partake in the ‘Transition Year Option’ as the year was then being referred to. Schools could apply to offer the year and, if permission was granted, schools were allowed to offer the Transition Year Option in the school year 1986-87. This was implemented as part of an extensive post primary reformulation. The following year, 1986, showed a marked increase in the uptake of the Transition Year Option in schools, with over 110 second level schools taking part. It was at this point that the pilot programme was considered to be over (Smyth 2004, p. 3, Jeffers 2008, p. 19). The ‘optional’ nature of the Transition Year led to little initial examination of the provision of the year or the pupils who were taking the year. Due to many of the schools who offered the Transition Year being fee paying schools the Transition Year became somewhat synonymous with privilege (Jeffers 2008). The ‘Transition Year Option, Guidelines for Schools’, a publication from the Curriculum and Examinations Board (1986) in 1986, led to a more formal basis for the year. It is from this point onwards that a pattern of increased engagement with and participation in the year is seen. These guidelines were broad in relation to the general policy for the Transition Year, and combined this with a specific focus on key aspects of the year. The primary aim of the year was stated as being for “the preparation of young people for their role as autonomous, participative and responsible members of society”. This set of guidelines focused on the organisational features of the year, such as the responsibilities of the principal and the appointment of a co-ordinator. The overall responsibility of the year was seen to be delegated to the co-ordinators.

2.4.1.3 Phase 3
The third phase of the year was brought about by the review of the Irish education system by the OECD (1991). The key recommendations were for a flexible and varied organisation of teaching and learning. This was considered to be needed in
order to “break down many of the present rigidities affecting the timetable, length of lessons, homework and so forth” (OECD 1991, p. 62). Furthermore it found that the “single homogenous class and the instructional models associated with it are not conducive to co-operative team work or to innovative approaches to teaching and learning.” (OECD 1991, p. 62)

Transition Year was mainstreamed in schools in the year 1994 and has since been known as the Transition Year Programme. The Irish government set out many of the recommendations of the OECD report as goals in the Green Paper ‘Education for a Changing World’ (Government of Ireland 1992). The major objective was for 90% of the cohort to complete senior cycle.

In 1993 a new set of Transition Year Guidelines were published, entitled ‘Transition Year Programme; Guidelines for Schools’ (Department of Education 1993c). The year was no longer referred to as the Transition Year Option. The language used to discuss the Transition Year at the time is reflective of the attitudes towards the year. It was no longer viewed as an option, but rather a mainline, mainstreamed programme, available to all schools and all pupils. This new set of guidelines differed from the previous one in a number of ways. The 1993 guidelines (which is still the current version) offer broader, less organisational guidelines; it is more flexible and less detailed. An appendix outlining examples of how the Transition Year could be offered within various curriculum areas is also included, which accounts for more pages than the actual ‘curriculum guidelines’ and ‘organisation’ (Department of Education 1993c, Jeffers 2008, p. 34). It was the belief that this set of guidelines would help to mainstream the year (Jeffers 2008). This approach was very much influenced by Hargreaves’ (1989) perspective on ‘teacher-led’ curricular initiatives, rather than ‘department-led’ ones (Jeffers 2008, p. 34).

A circular letter M31/93 (Department of Education 1993a) was issued in July 1993, informing schools of the re-structuring of senior cycle education. A follow-up circular (M47/93) was sent to schools the following November, which gave greater detail to how the revised senior cycle would be structured and operated from 1995 (Department of Education 1993b, Jeffers 2008, p. 35). This circular states that the ‘Transition Year Programme: Guidelines for Schools’ will be revised by the National Council for Curriculum and Assessment, who will provide a new set of guidelines for the Transition Year in 1995. This has never happened, and the Transition Year
continues to operate under the guidelines issued in 1993. The Transition Year was officially mainstreamed and made available to all schools in 1994 (Smyth et al. 2004, Murphy and McConnell 2006, Jeffers 2008). The 1993 guidelines signified a shift in the perspective of the vision of the Transition Year. While the year was no longer an ‘option’, but now a ‘programme’, a whole school approach was also emphasised, with interdisciplinary work strongly encouraged (Department of Education 2000).

### 2.4.1.4 Phase 4

In 2003 the National Council for Curriculum and Assessment proposed further development of the senior cycle. The proposal, which included the redevelopment of the Transition Year, stemmed from concern that the benefits of the Transition Year needed to be “spread more equitably across the system” (National Council for Curriculum and Assessment 2003, p. 6). Further publications in 2005, ‘Proposals for the Future Development of Senior Cycle Education in Ireland’ (National Council for Curriculum and Assessment), and 2008 ‘Senior Cycle Moving Forward’ (National Council for Curriculum and Assessment), expanded on the plans for the redevelopment of senior cycle education.

The proposal suggested two options: a two year senior cycle and a three year senior cycle. Both will include Transition Units, short courses, main subjects, and school courses. There is much ambiguity as to what this will do to the Transition Year or how it will change it. However, the development of the Transition Units has been outlined. The National Council for Curriculum and Assessment set out to develop Transition Units, in conjunction with schools and teachers, for the Transition Year Programme. Transition Units (TUs) are 45 hour courses that build on successful modules already offered by many schools as part of their Transition Year (National Council for Curriculum and Assessment 2008a). In developing Transition Units, schools may decide to adapt existing TY modules and offer them as TUs, or develop new units ‘from scratch’. The important factor is that they are written to a common template and can be shared between schools. Sample Transition Units can be found on the senior cycle website: www.ncca.ie/seniorcycle (National Council for Curriculum and Assessment 2008c).
Transition Units can be developed in a number of different ways:

- by building on a module already offered in Transition Year;
- by developing a new Transition Unit from scratch;
- by working with an external agency such as a Non Governmental Organisation (NGO);
- by adapting sample Transition Units made available on the NCCA website.

The Transition Unit wheel (Figure 2.5) has been designed by the NCCA in order to give an idea of some of the types of Transition Units that schools could develop.

Figure 2.5: The Transition Year Unit wheel (National Council for Curriculum and Assessment 2008c)
The NCCA hopes that schools will prepare a written outline of each of the TUs they offer in senior cycle. The NCCA has developed a template to help schools write these unit outlines. The main elements covered in the template are:

- Title of transition unit
- Area of study
- Aims
- Summary outline of unit
- Learning outcomes
- Key skills
- Links
- Methodologies
- Assessment methods
- Evaluation
- Resources

(National Council for Curriculum and Assessment 2008c)

This project has been developed in the hope of creating a set of standardised resources for teachers to use and build upon in both their Transition Year and in the senior cycle. At the moment the project is only in its infancy, however, it is hoped that it will begin to develop over the next few years. Teachers are currently working with the NCCA in developing and piloting the Transition Year Units. However, with current budget cuts there is no given time span for the pilot phase of the project to be completed (National Council for Curriculum and Assessment 2008b).

2.4.2 The Current Transition Year Programme

The Transition Year Programme as it stands is currently in the fourth phase of development; however, his phase of development is currently at somewhat of a standstill. This chapter section will examine the Transition Year Programme in terms of its national uptake and provision, overall aims, curriculum, benefits of the year, and attitudes towards the year.
2.4.2.1 Provision and Uptake of the Year

The Transition Year, given its optional nature, is not provided equally to pupils among Irish schools. Smyth et al. (2004) have found provision of the year varies dramatically across school types and school gender intakes. The highest levels of provision have been found in single-sex female schools, particularly in secondary and community & comprehensive schools. The lowest levels of provision are in vocational schools (Smyth et al. 2004, pp. 18-39). The size of the school has also been found to be a factor in whether the year is offered to pupils, with the highest level of provision occurring in large schools.

Schools also differ in whether they offer the programme as an option to their pupils, or whether it is compulsory. Co-educational secondary schools are more likely to offer the programme on a compulsory basis than other schools. In addition, where small schools offer the year they are also more likely to make it compulsory, as they may not have adequate facilities or staffing to do otherwise, while a compulsory Transition Year make it a viable year in small schools.

Currently uptake of the Transition Year has increased dramatically when compared with the initial figures (30% of pupils) from when the programme was first mainstreamed (Smyth et al. 2004, Jeffers 2008). The types of pupils who take the Transition Year differ from the main second level cohort. Pupils who come from a higher socio-economic background are more likely to take the Transition Year, when compared to pupils from a semi-skilled or unskilled professional background. This is also true for pupils whose parents received third level education. There is no strong level of gender differentiation among pupils who take the year, but there is a slightly higher level of female pupils who take the year. Older pupils are less likely to take the year, and pupils who maintain positive attitudes and views towards their schooling are also more likely to take the year. Thus, the Transition Year has gained a reputation as a more middle class endeavour, with little representation from pupils who come from disadvantaged or working class backgrounds. (Smyth et al. 2004, pp. 41-53)
Table 2.5: Current uptake of the Transition Year Programme.

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of Schools</th>
<th>Percentage of pupils taking the Transition Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006-07</td>
<td>524 (71.3%)</td>
<td>46.7%</td>
</tr>
<tr>
<td>2007-08</td>
<td>540 (73.7%)</td>
<td>47.1%</td>
</tr>
<tr>
<td>2008-09</td>
<td>528 (73.3%)</td>
<td>50.6%</td>
</tr>
<tr>
<td>2009-10</td>
<td>552 (76.0%)</td>
<td>53.3%</td>
</tr>
</tbody>
</table>

The figures shown in Table 2.5 indicate the total number of schools offering and students taking the Transition Year Programme. These figures are the most recent ones available and show that a significant portion of students are opting for the Transition Year Programme. However, it remains an optional programme, both for the school and usually for the pupil. It is not offered by all schools and if offered, pupils do not have to take it in many schools.

2.4.2.2 Aims of Transition Year:

As stated by the Department of Education (1993c, p. 4) in the Transition Year Guidelines, the aims of Transition Year are:

- “Education for maturity with the emphasis on personal development including social awareness and increased social competence.
- The promotion of general, technical and academic skills with an emphasis on interdisciplinary and self-directed learning.
- Education through experience of adult and working life as a basis for personal development and maturity.”

One of the main aims of the Transition Year programme is to produce more self directed learners from Transition Year, “through the development of general, technical and academic skills.” (Department of Education 1993c). The Transition Year Guidelines state that an emphasis on the promotion of personal development and maturity for the student, and maturity through the development of skills and experiences will help create self-directed learners. Transition Year therefore is designed to provide:
a bridge to enable students to make the transition from Junior to Senior cycle. It encourages personal and social development and recognises the need for students to grow in independence.”  

(Department of Education 1993c, p. 3)

2.4.2.3 The Transition Year Curriculum

The Transition Year does not have a curriculum *per se*, but, the Second Level Support Service developed the ‘onion model’ in Figure 2.6 below as a guide for schools offering the Programme.

Figure 2.6: The ‘Onion model’ (Second Level Support Service 2006)

The above Figure 2.6 is what the Department of Education and Science and the Second Level Support Service (SLSS, now the PDST) refer to as the ‘onion’ model and shows the main areas of the Transition Year course. The four areas are the Core Subject layer, the subject sampling layer, the TY specific module and subject layer and the Calendar – ‘once off’ layer.
The core layer includes subjects such as English, Irish, Mathematics, Physical Education and Religion. Science may be offered in either the subject sampling layer with other subjects such as Spanish, Business Studies etc or as a modular programme in the TY specific module and subject layer. The Calendar layer is designed for once off events, such as field trips, work experience, outreach and visiting speakers. Unfortunately, as in the Junior Cycle and Senior Cycle, Science is not a core subject and it is entirely up to the school whether or not to offer it.

2.4.2.4 Benefits of Transition Year

Several studies have indicated that the Transition Year has many benefits to offer pupils (Department of Education 1996, Millar and Kelly 1999, Smith and Matthews 2000, Jeffers 2002, Smyth et al. 2004, Jeffers 2007a;2008;2011). These benefits are outlined further below in Figure 2.7.

![Figure 2.7: Benefits of the Transition Year Programme](image)

**Better Examination Results**

One issue that both parents and teachers alike seem to worry over is whether Transition Year is beneficial for the pupils. If not run and treated properly by the school the Transition Year can become a disaster. It can either be a “doss” year for
pupils, where they have very few classes and don’t do much work. Alternatively it can be used as an extra year of the Leaving Certificate, with subjects, including Science being taught from the Leaving Certificate syllabus. The latter of these two issues is very much discouraged by the Department of Education and Science (Smyth et al. 2004). The official line is that “There is universal agreement among contributors to the consultation that participation in a TY programme is beneficial to students” (National Council for Curriculum and Assessment 2003).

However, the Economic and Social Research Institute (ESRI) has done studies on schools across the country and many of these evaluate the Transition Year programme. In particular; ‘The Transition Year Programme and Assessment’ is a key text for gaining an insight into the benefits of the Transition Year Programme. This study was compiled using a number of different data sources. Those sources included postal surveys of second level school principals; there was also a follow-up of previously surveyed Junior Certificate pupils and case studies in 12 schools. The database used to follow up on previously surveyed Junior Certificate pupils was a particularly rich source of data as it contained information from previous studies by the ESRI on ‘Do Schools Differ’ (Smyth 1999) and ‘Who Chooses Science?’ (Smyth and Hannan 2002). This database provides a nationally representative source of data, as it covers 10,000 pupils at Junior Certificate and Leaving Certificate level (Smyth and Hannan 2002).

This study found that Transition Year participants have higher grades in their Leaving Certificate than non-participants, the average difference between the two being just over two grade points per subject. However the weighted average difference across the strata is just over 1 grade point per subject. A grade point in this study involved scoring each examination grade (i.e. A1 – F) from 0 to 28 and averaging the total scores over the number of examination subjects taken. This indicates that around half the performance gap is due to the kind of pupil who takes Transition Year. The research showed on average that a pupil who took Transition Year were more likely to get higher grades in their Leaving Certificate and was also more likely to go on to higher education.

Transition Year can be quite influential on pupils’ subject choice at Leaving Certificate level. In ‘The Transition Year Programme An Assessment’ Smyth and
Hannon (Smyth et al. 2004) noted that it would appear “that taking part in Transition Year has an important influence on young people’s subsequent route through the senior cycle.” This influence on subject choice has been mostly seen in the uptake of business subjects at Senior Cycle, and then on to third level. An explanation for this may be the large impact of mini-companies in Transition Year and the emphasis put on the promotion of business subjects through these projects (Smyth et al. 2004).

The longitudinal study carried out by the NCCA on 1994 Junior Certificate Candidates who took the Leaving Certificate in 1997 is a valuable source of information on the benefits of the Transition Year Programme. This report noted that pupils who took the Transition Year Programme were more educationally adventurous than those who did not; they were more likely to retain subjects at a higher level, and were also more likely to take up new subjects in fifth year.

Those who took Transition Year also scored higher Leaving Certificate points than those of their peers who did not take Transition year with a difference of 46 CAO (Central Applications Office) points between the two groups.

Attention is also drawn to the positive impact that Transition Year has in disadvantaged schools, with those pupils in disadvantaged schools who have taken Transition Year doing significantly better than expected and better than those in similar schools who did not take the programme, particularly when viewed in the context of prior results (Jeffers 2002, Smyth et al. 2004, p. 222-223).

**Psychosocial Development**

Another, perhaps less examined, yet nonetheless important benefit of Transition Year is the opportunity for the pupils’ psychosocial development. Eric Erikson (Snowman and Biehler 2003) was a psychologist who identified eight stages of psychosocial development. These stages are:

- Trust versus Mistrust
- Autonomy versus shame and Doubt
- Initiative versus Guilt
- Industry versus Inferiority
- Identity versus Role/Identity confusion
- Intimacy versus Isolation
- Generativity versus Stagnation
- Integrity versus Despair

Figure 2.8: The stage and crisis that applies to Transition Year pupils.

Figure 2.8 illustrates the stage and crisis that best relates to adolescence and pupils in Transition Year; the crisis of Identity versus Role/Identity confusion. The Transition Year occurs at a time in a pupil’s life when they begin to “question beliefs, attitudes and value systems that they had internalized previously without much thought.” (Good and Brophy 1990, p. 101). Transition Year, with its relaxed curriculum and emphasis on the emotional development of the pupil allows an opportune time for adolescents to develop their own identity. James Marcia sees the identity crisis at this stage and offers a solution through crisis and commitment. (Snowman and Biehler 2003). It is during this stage in the adolescents’ life that he/she becomes most concerned with acceptance and how they appear to others. With the scope for and encouragement of various projects, use of teaching and learning styles in Transition Year, the adolescent and their peers face working together in groups in a way which they have never experienced before., essentially becoming a part of a unique Transition Year community within the school. “Transition Year was seen as facilitating improved relations between teachers and students” (Smyth et al. 2004, p. 166).

Data on the Transition Year has shown that ‘Education for Maturity’ is something that it does very well. As Jeffers (2002, p. 2) noted “A consistent thread through the
data from all informants is that students are more mature as a result of the TY experience” and perhaps this is because pupils take note of TY activities as they involve “learning beyond conventional classrooms” The pupils “value classes in which their opinions are sought and listened to.” (Jeffers 2007a)

Pupils are psychologically at a vital stage of development during the years of 15-16 (the age groups in Transition Year). They are developing a sense of identity and belonging, as the educational theorist and psychologist James Marcia suggested when he spoke of crises. Marcia notes that adolescents experience these crises during Erikson’s stage of Identity versus Role/Identity confusion. He suggested that adolescents go through a series of different crises which allows them to develop their own perceptions of themselves. Marcia notes that adolescents experience these crises during Erikson’s stage of Identity versus Role/Identity confusion (Snowman and Biehler 2003).

These perceptions are known as identity statuses: the various identity statuses are diffusion, foreclosure, moratorium and achievement. Diffusion involves thinking about jobs, roles and their values. Those in the foreclosure stage take their parents’ beliefs and values unquestioningly. Individuals in the moratorium stage are uncertain about their own identity and those who have reached achievement status have made their own commitments. These statuses are developed through times of crisis and commitment in an adolescent’s life.

“Crisis refers to times during adolescence when the individual seems to be actively involved in choosing among alternative occupations and beliefs. Commitment refers to the degree of personal investment the individual expresses in an occupation or belief.”

(Marcia 1967 cited in Snowman and Biehler 2003, p. 30)

Transition Year therefore provides an opportunity for this status development through the directed learning it offers and the commitments that the students have to make to their roles within the Transition Year community.
2.4.3 Attitudes towards Transition Year

Attitudes towards the Transition Year are characterised by ambiguity according to Jeffers (2007b;a;2008). Junior Certificate pupils’ attitudes are generally positive, but tempered with ‘vagueness’ about the year. Pupils’ knowledge is somewhat limited and the primary reasons for wanting to enrol in the Transition Year are associated with wanting a break from the pressurised, examination-focused junior and senior cycle (Jeffers 2007b, p. 35). Negative attitudes are manifested in pupils’ fears that the year could be a waste of time, or a ‘doss year’, making returning to the examination-focused senior cycle more difficult (Jeffers 2007b, p. 38). Jeffers (2007b) found that pupils who were in the Transition Year Programme, had some similar attitudes, regarding the year, to Junior Certificate pupils, but that they also offered other interesting insights into how their experiences of the year had shaped their attitudes. Transition Year pupils are positive about the increased maturity that the year brings, and the effect that this can have on their confidence in social settings. Pupils also refer to their educational experiences, and highlight trips and informal learning opportunities as important features of the programme, which have influenced their attitudes towards it (Jeffers 2007b, pp. 42-47). Overall the features of the Transition Year programme were valued such as improved pupil-teacher relationships, time for discussion and debate, being treated like a mature adult and the clarity it can provide for career choice. Some negative attitudes were expressed by pupils; these were mainly around the area of group work (which other pupils displayed very positive attitudes about), as some pupils felt that others were ‘coasting’ and getting by without contributing much to the group. Other frustrations are generally to do with poor behaviour of other classmates and discipline issues (Jeffers 2007b, pp. 47-48).

There are similar issues with teachers; and there is a sense of uncertainty about the Transition Year. The Transition Year teachers are broadly positive and display positive attitudes towards the year, particularly towards the pupils’ development and maturity, broad educational experiences, skills, motivation and career goals. However, teachers feel that the Transition Year is school specific, and is only as good as the school, and team providing it (Jeffers 2007b, pp. 79-117). Teachers are
generally positive about the programme, but do feel that there are major challenges in implementing it.

2.4.4 Science in Transition Year

“Transition Year is an opportunity for pupils to become familiar with a broad range of Science activities. Pupils should be encouraged to study areas of Science not heretofore encountered”

(Department of Education 1993c, p. 27)

The Transition Year is a year with no syllabus and no curriculum other than some broad educational guidelines. This freedom offers teachers the opportunity to contextualise Science in terms of its role in pupils’ life and society (Science and Technology in Society (STS)). This STS focus has been found to be beneficial to pupils in their learning of Science, enhancing their overall experience of the subject and their perceptions of Science, and Science teachers and narrowing somewhat the gender gap in terms of interest in Science (Smith and Matthews 2000). Transition Year Science sampling offers an opportunity for pupils to make informed decisions about their subject choice at senior cycle. The Association of Secondary Teachers in Ireland believe that Transition Year should aim to develop pupils’ “scientific skills and to promote a greater awareness of the role of science in their lives” (Association of Secondary Teachers Ireland 1992, p. 16)

Smith and Matthews (2000) note that “…the scope of the syllabuses at Junior Certificate and Leaving Certificate are narrow, being largely concerned with matters internal to science rather than to the role of science (and technology) in society” The opportunity provided to teachers by the Transition Year could be crucial in the development of scientifically literate citizens, the promotion of positive attitudes towards Science and interest in and uptake of Science.

In the Transition Year schools can vary in what they offer as a Science taster programme. Generally Transition Year schools either offer a taster course in one or more of the Sciences offered at senior cycle or they offer a general Science course, similar to the Junior Certificate one. The most common taster courses being offered are in Physics, Chemistry and Biology.
Science subjects in second level schools across most of Europe, and indeed the world, are in decline. Pupils and teachers alike are becoming increasingly frustrated with the lack of relevant and interesting curriculum materials available. Unfortunately as indicated in much of the research, the traditional Science subjects are not favourably perceived. Most schools have a very low uptake level of Science subjects to senior cycle, with even smaller numbers continuing on to take scientific subjects in third level.

Science needs to be appreciated for the intrinsic pleasure it can offer an inquiring mind and it should be taught in this fashion. Transition Year is a unique opportunity to do just that, with the freedom and autonomy it offers to schools and teachers, allowing pupils who might have otherwise not appreciated Science, to learn to become excited by it and to love it. A good Science sampling programme in Transition Year can lay the foundations for a rich and rewarding scientific career for many pupils. Transition Year is not part of the Leaving Certificate cycle and time should not be spent on covering Leaving Certificate material. However, it may augment the Leaving Certificate syllabus as well as building upon Junior Cycle material. It is an opportunity to provide students with a balanced exposure to the sciences (Department of Education and Science 2002).

Transition Year Science offers a broad opportunity to realise many of these goals in the Irish context. In particular the opportunity to offer an innovative Science curricula focusing on developing an understanding of Science in real-life contexts, is a realistic and manageable objective within the Transition Year Programme and is in accordance with the Transition Year Guidelines. A “Transition Year Science module should explore the links between science and society” (Department of Education 1993c).

Developing and extending the ways in which Science is taught is one of the goals of the Transition Year programme, as the guidelines state; “A key feature of Transition Year should be the use of a wide range of teaching/learning methodologies and situations.” (Department of Education 1993c)

Transition Year is a unique opportunity to meet many of this reports’ recommendations. As an innovative and optional year in the second level school cycle, it provides the foundations for producing a Science course to stimulate and
motivate pupils, to produce scientifically competent citizens and future engaged pupils.

The Statement of Strategy for Science, Technology and Innovation (Department of Enterprise Trade and Employment 2006, p. 11) noted that Discover Science and Engineering (DSE) will develop a Transition Year programme designed to motivate pupils entering the senior cycle to continue to study Science. However, this has not yet been followed through. The plan of the DSE is for the following:

- Development of a “one-stop-shop” online for Transition Year science and technology projects;
- Development of new tool to support collaborative project-based learning at TY Project Blogger;
- Partnership with Transition Year Coordinator;
- Pilot with schools 6 schools from Sensors 07/08.

(Brabazon 2008a)

Peter E. Childs of the University of Limerick has long been an advocate of, what he refers to as the N.I.C.E. approach, for the teaching of Transition Year. The significance of these letters is:

- **Novel**: We should try and do something new with this extra year and give the students new experiences, try out new approaches and non-traditional approaches to teaching science. Thus we might take a project or topic-centred approach, we might adopt an STS focus (Science-Technology-Society), we might set up mini-companies to produce and market products etc. There's no shortage of ideas for novel ways to teach chemistry or science.
- **Interesting**: Our aim should be to make the Science our students do in Transition Year as interesting as possible, building on the students' own interests and needs, and showing the relevance of Science to their everyday lives. Trying new ideas will help
in this but at the end of the Transition Year Science course we want students to say about their experience of science: “that was great!”

**Career-orientated:** An extra year will give us a great opportunity to make students more aware of the range of science-based careers and courses available to them, to enable them to see chemists and chemistry in action in real life, so that they can make more realistic subject choices for the Leaving Certificate courses. This would involve building a programme of visits to industry, work-experience and visiting speakers into the transition year course.

**Educational:** The Transition Year course should be educational in the broadest sense for the whole person. It should stretch and develop our students intellectually, it should help them develop and practise appropriate manual skills (not just intellectual skills) and it should also seek to develop personal qualities and positive attitudes. These last two aspects are often left out of exam-directed courses and the transition year course is a good place to broaden the education of our students. Science is a particularly good vehicle for doing this because it includes both practical and mental skills, and when applied to society it also brings in value-judgements” (Childs 1994).

These ideas have been developed from 2003 onwards in the ‘TY Science’ project discussed later.

### 2.4.4.1 Previous research into Transition Year Science

There have been relatively few research studies in the area of Transition Year Science, particularly considering that the Programme has been in place since the mid-nineteen seventies. However, those that have been conducted have been primarily intervention type studies, aimed at improving pupils’ attitudes and uptake patterns in Science (Smith 1998, Smith and Matthews 2000, Sheehan 2004, Broggy 2005, Hayes 2007, Hayes 2009, Murphy 2009, O'Dwyer 2009, Matthews 2010, McDonnell 2010, Ryan 2010). In addition, certain studies (The Relevance of Science Education (ROSE) study) are of particular interest to this study, as they were conducted with Transition Year Science pupils (Matthews 2007). While all of these studies have been informative and given insight into Transition Year teachers’ and pupils’ attitudes towards Science, they have not provided a picture how Science is taught or valued within the year. One study (Lally 2007) did offer a glimpse into this theme, as is discussed below.
The place of Science in the Transition Year: Pilot Study

A study investigating what is being taught in the Transition Year Science was conducted in 2007 by Lorraine Lally as a Final Year Project at the University of Limerick (Lally 2007). This study used both pupil and teacher questionnaires to discover how Transition Year Science was being taught. The questionnaires used a variety of question types including dichotomous, filter contingency, matrix and scaled questions, while also allowing for free response in many of the cases. The study was done in 17 schools in Co. Galway.

The results of this study showed that 97.1% of the pupils surveyed had previously taken Junior Certificate Science, agreeing with the relevant research. Over 50% of pupils felt that Junior Certificate Science impacted on their decision to take up Science at senior cycle. One third of the pupils surveyed said that Science was not in their top four favourite Junior Cycle subjects, with only 12.4% ranking Science as their favourite subject.

Unsurprisingly Biology ranked top as the most preferred Science subject, with 79% of the pupils selecting it. Pupils (67%) also believed that Biology was the easiest science subject. Although 92.75% of pupils said that they would study a Science subject for the Leaving Certificate, Biology was the top subject that the majority of pupils planned on taking, with only 4.7% of those planning to take Chemistry and 3.9% opting for Physics. No pupil planned to study all three Science subjects. Reasons for the subject choice were that pupils declared that they did not have any interest in Science and that it was too difficult and they had been advised against it.

From the teachers’ survey, it was found that Transition Year is compulsory in 19% of schools surveyed. All teachers believed that Transition Year was having a positive impact on the pupils, particularly with regards to their subject choice for the Leaving Certificate. Teachers agreed with pupils and believed that Biology is the most popular Science subject in their schools.

Unfortunately 61.9% of teachers surveyed teach from the Leaving Certificate Science course, contrary to the ethos of the Transition Year guidelines and two-thirds (66.7%) are not aware of any published resources. This lack of awareness is one of the probable reasons for teachers reverting to the Leaving Certificate syllabus (Lally 2007, pp. 69-195).
The results of this study indicate that the “differences in methods between those teaching traditional academic subjects and those teaching “Transition Year” subjects are fewer than might be expected” (Smyth et al. 2004, p. 118). Change in practice is difficult and despite the Transition Year Programme offering significant opportunities for a change in teachers’ practice it is difficult for this to occur. The results of the pilot study were interesting and used as the basis for the development of this particular study, described in this thesis.

2.4.4.2 Science Resources for Transition Year

Some resources developed specifically for the Irish Transition Year are described below:

**PharmaChemical Ireland’s Transition Year Science Resources**

PharmaChemical Ireland, in conjunction with Discover Science & Engineering and the Transition Year Curriculum Support Service (TYCSS) has developed a series of science modules for Transition Year students. There are a variety of modules available:

- Forensic science
- Sports Science
- Microbiology
- Cosmetic chemistry

Each module consists of the following sections: Brief Career Information, Student Worksheets and Teacher Packs. The modules are designed so they can cover one or several class periods - depending on what is more suitable for individual schools. All of the material is freely available on CR-ROM upon request.
Science and Technology in Action

“Science and Technology in Action is a multi-faceted resource. The hard copy presentation pack contains lessons and associated teaching materials. The lessons are designed in close collaboration with practising teachers and advisors. Each lesson relates to the activities of one of the participating organisations. In this way the lessons help to enhance the relevance of Science to our everyday life. This grounding in reality is designed to raise awareness and engage students in the world of applied science and technology.”

These resources are folders with accompanying CD ROMs which were distributed to all second level schools in Ireland in 2005 and 2006 (1st and 2nd editions). Each lesson is associated with one of Ireland’s leading scientific companies and its activities. The second edition (released in 2006) deals with the application of science and technology in real life situations. Both the first edition and the second edition contain nineteen lessons in ring binders, while the accompanying CD ROMs contain all lessons in a printable format (AG Educational Services 2005;2006;2007;2008;2009;2010).

X-ploring Science Website

The X-ploring Science website, produced and designed by Humphrey Jones, is designed as a tool to allow students to take responsibility for their own learning. There are a series of web-quests aimed precisely at Transition Year Science students. The web-quest is used to allow for a structured learning approach when using the Internet for research purposes, reducing the endless searching for relevant information that can so often happen when not using the internet appropriately for research purposes. Each web-quest provides the students with a task, guidelines for carrying out the task, resources and links, related puzzles, and a means of evaluation. For the teacher, the work is minimal but all information with regards assessment is clearly presented. Students become the scientist and have to research the topics. The web-quest model provides a safer, more structured approach to using ICT in the
classroom. Students become more independent, learn organisation skills, presentation skills, team building skills and of course general IT skills (Jones 2004).

The following topics are explored: Ecology, Flight, Space, Evolution, and Elements.

‘TY Science’ Modules

Peter Childs at the University of Limerick, in conjunction with trainee science teachers, has also developed resources for the Transition Year programme. These resources are known as ‘TY Science’ modules. The ‘TY Science’ modules were first developed in 2002 and ten 8-9 week modules have been developed, piloted, revised and made available to teachers at low cost. Some of the modules have been fully evaluated through pupil and teacher questionnaires and diaries, and the others were revised on the basis of teachers’ diaries and questionnaires (Childs et al. 2010). Two more modules are being developed, piloted and evaluated this year (2011/12). The students involved have developed the modules as part of their Final Year Projects, providing them with experience of curriculum development and implementation. The modules are designed to meet the TYP guidelines and build on Junior Science, with an emphasis on active learning. The TY Science modules offer science teachers a wide choice of suitable resources to choose from to meet the TYP objectives and provide a stimulating introduction to Leaving Certificate science courses. The project has utilised the innovative ideas and the energy of trainee teachers in collaboration with the expertise and experience of teachers in Irish schools. Each resource is produced in the same format. There are 8 week long units – each consisting of one single lesson and one double lesson, with an optional extra single lesson. Each unit relates to the overall theme of the module but, can be taught independently. These 8 units make up the module. The modules that have been produced to date are:

- The Science of Sport
- Forensic Science
- Cosmetic Science
- Environmental Science
- Science of Survival
- Food Science
- Science and Medicine
- Issues in Science
• Energy
• Waste

The basis of these modules is a constructivist approach, with an emphasis on practical work, active and problem-based learning. These modules are presented in the form of a photocopiable student handbook and teacher’s guide. One of these modules also comes with accompanying CD ROM containing presentations. The modules are available for sale as a teaching package and over 600 have been sold to date, with positive feedback from teachers (Childs et al. 2010).

**Cutover & Cutaway Bogs Education Pack**

The Irish Peatland Conservation Council (IPCC) offers the Cutover & Cutaway Bogs Education Pack. This is a 120 page Transition Year package for pupils. Its focus is on the bogs of the Irish Mid-lands. There are 12 chapters on wildlife, habitats, archaeology, socio-economic uses and after use of the cutover and cutaway bogs. The pack also includes:

- Over 150 colour photographs of cutover and cutaway bogs.
- Twelve chapters written by experts on the wildlife, habitats, archaeology, socio-economic uses and after use of the cutover and cutaway bog resource.
- Step by step directions for three practical projects on cutover and cutaway bogs for you to do with transition year students.
- 10 Work sheets.
- Photographic guide to the key species and habitats of cutover or cutaway bog.
- Picture I. D. charts to over 100 plants and animals.
- Soil and peat types key.
- Glossary of 50 technical terms
- Detailed practical information on 9 sites to visit.
- Checklists of birds, plants and animals.

There is also an online educational resource at the address below which can be used either to complement the Transition Year pack or as a standalone resource (Irish Peatland Conservation Council 2004).
Transition Year Units
Currently under the auspices of the National Council for Curriculum and Assessment (NCCA) new Transition Year Units are being developed, however, due to current budget constraints it is unknown when these units will be launched (National Council for Curriculum and Assessment 2008c).

Inspiration for Science Teachers Resource pack

Intel’s ‘Design and Discovery: A Transition Year Module’
This is a multi-disciplinary module, developed originally in the United States of America, and redeveloped in conjunction with Philip Matthews (Matthews 2010), for the Irish context. This module was offered to 100 schools, after initial piloting with 2 schools, redeveloping and further testing with 20-30 schools. There were plans to have a further more thorough evaluation of this project, but this has not taken as of yet, due to budgetary cutbacks (ibid). The core focus of this module is to promote a ‘hands-on’, creative approach to problem solving by presenting pupils with real life issues to solve. The module was developed using an inquiry-based approach. The module contains both a teacher guide and a student booklet. There module is divided up into five core areas (understanding the design process; engineering fundamentals; thinking creatively about problems and solutions; making modelling and materializing; prototyping and final presentations) and each one of these components contains two to four ‘sessions’, with fifteen sessions in total. Each session is designed to take three lessons (three 40 minute lessons) (Intel Education 2010b;a). This module has also been validated by the NCCA as a Transition Unit (National Council for Curriculum and Assessment 2010).
Institute of Physics ‘TY Physics’

This resource is not a module in its own right, but is a comprehensive source of information offering teachers a summary of the Transition Year Physics modules and projects available across the country, a list of popular Physics books for a Physics book club, and potential work experience venues in the area of Physics for pupils (Institute of Physics in Ireland 2010).

2.5 Schools – the purpose of schooling and the effective school

Schools are multifaceted organisations that do not exist in isolation. The context in which a school is set is of vital importance to the experiences of its pupils (Prosser 1999, pp. 7-8). Schools have to deal with continuously changing goal posts, and keep in line with changing expectations from society, as well as enhancing the academic and social development of their pupils. Schools are therefore often referred to as “dynamic organisations, continually adapting to changes in pupil intake, staffing levels and curricular provision” (Smyth 1999, p. 226). Fullan and Stiegelbauer (1991, p. 14) propose two major purposes for schooling: to educate pupils, both in terms of their academic and cognitive development and in terms of their personal and social development. Superimposed upon these purposes of schooling (in a democratic society) is also the goal of equality of opportunity and achievement.

Assessing school effectiveness requires choosing among competing values. Smyth asks

“What do we expect our schools to accomplish with their pupils? Is academic performance the most important goal of the educational system, or should we also be concerned with pupil retention and personal/social development?”

(Smyth 2000, p. 36).

Smyth (p. 37) expands upon these questions to note that “school effectiveness must be seen as multidimensional; a school may be “effective” in relation to exam performance, pupil drop-out and/or personal development”. Smyth’s (2000) study focuses on academic achievement as a measure of school effectiveness. Reid et al.
(1987, p. 18) believe that an effective school displays certain organisational characteristics. The organisational characteristic of an effective school are:

- Curriculum focused school leadership
- Supportive climate within the school
- Emphasis on curriculum and innovation
- Clear goals and high expectations for pupils
- System for monitoring pupils’ performance and achievement
- Continuous staff development and in-service
- Parental involvement and support
- Support from government bodies

The organisation and processes of schools do have an effect on its pupils in terms of their academic achievement and development (Smyth 1999). Smyth (2000, p. 44) found that pupils do better academically in schools with mixed ability classes, with a positive disciplinary and academic climate, where pupils felt involved in the life of the school and where the quality of the relations between teachers and pupils was good. The purposes of schools and the characteristics that make them effective have implications for the Transition Year, as the year is meant to be developed with a whole school approach. The purposes of the Transition Year programme are complex, with implications for the whole school context and purposes of schooling.

The mission of the Transition Year is an ambitious one:

“To promote the personal, social, educational and vocational development of pupils and to prepare them for their role as autonomous, participative and responsible members of society.”

(Department of Education 1993c, p. 4).

In addition to this mission statement, the goals and objectives of the programme (p. 4) add that the schools who offer the programme should “involve parents, work providers and the wider community as educational partners in all aspects of the programme and ensure efficient and effective delivery of the programme.”
These statements in the Transition Year Programmes Guidelines are highly demanding and can lead to difficulty for schools. They are not typical of the ‘traditional school programmes’ such as the Leaving or Junior Certificate and require schools to take very different strategies, in both their planning and teaching and learning approaches for the Transition Year. The aims cited in the Transition Year Programme guidelines broadly concur with Fullan and Stiegelbauer’s (1991) vision of the purpose of schools. Both the cognitive and affective domains are encompassed within this view. Also, the Transition Year Programme requires much of the same supports and organisational characteristics of an effective school in order to function at its full potential.

2.5.1 School culture

The very notion of school culture is enigmatic (Prosser 1999, p. 1). Jeffers (2008) suggests that there is much merit to be had in examining school culture, as it aids in the understanding of innovation and resistance in the school context. Every school and department will have its own specific character, “conditioned by its history, staffing and the school in which it was set” (Donnelly 2000, p. 272). One can almost ‘sense’ the atmosphere of a school as one walks in the door. All schools are different, with each setting their own “tone, vibrations and soul”, and making them unique. (Reid et al. 1987, p. 3).

Dalin (1993, p. 20) proposes that the “school culture has a major influence on the quality of opportunities that the school provides for each child. The ethos of the school as a whole and the climate of the individual classroom have a direct bearing upon teaching and learning.” Teaching and learning are central to everything that happens in school, but are not always central to a schools’ public discourse, which in turn effects the climate of the school (McDermott and Richardson 2005, p. 38).

The OECD (1991) review of Irish education identified the key features of the culture in the Irish school system. A crucial feature of the Irish second level system was the widespread use of didactic pedagogies, and the absence of other types of teaching and learning. The review also noted an emphasis on textbooks and memory for examinations, and the culture of authoritarian-style relationships between pupils and
teachers. This culture of teaching to the examination is a familiar one within the Irish school system (Lynch and Lodge 1999, Smyth et al. 2007). Pupils do better in examinations in schools where teachers have high expectations for them (Smyth 2000, p. 42). However, despite teachers’ anxious efforts to ‘teach to the test’,

“the informal climate of the school is found to have a significant and quantifiable effect on pupil performance. As a result, the development of a positive school climate should be emphasised in both initial and in-service training for teachers and management.”

(Smyth 2000, p. 42)

The difficulty is that the culture of the school and the classroom setting has a tendency to remain quite stable over the years (Dalin 1993, p. 20). The schools’ ethos is a key feature in change and improvement (Prosser 1999, p. 12). A schools’ culture and climate can have a considerable effect on the success or failure of the schools’ Transition Year Programme. A culture of communication, sharing, use of innovative teaching and learning methods can have significant benefits when implementing the Transition Year. Smyth et al. (2004) recommend that a successful Transition Year should feature a whole school commitment to the programme, use of innovative teaching methods and assessment, time for development, co-operation and re-evaluation.

2.5.2 Curriculum Innovation

There has been considerable focus on curriculum development and innovation since the 1960s. It is “being increasingly accepted as part of professional responsibility of teachers” (Crooks and McKernan 1984, p. 1). Curriculum is taken to mean “simply the range of subjects, with their individual syllabi, that are approved for study at a particular level.” (Crooks and McKernan 1984, p. 1)

Curriculum development in Ireland has traditionally been a top-down endeavour, Jeffers (2011, p. 65) suggests that the ‘rigidity’ of this tradition in Ireland has been “further consolidated by a single nationwide examination system”. Thus, a strong culture of teaching being constrained by curriculum and examination, leaving little
innovation has permeated the Irish school system. Gleeson (2004;2010) proposed that curriculum policy and practice in Ireland is dominated by the technical, stemming from a fragmented system, rather than the practical and further liberation of practice.

Eisner (1992, p. 110) notes that it is “much easier to change educational policy, than to change the ways in which schools function”. Curriculum innovation does not merely involve changing curriculum policy, or documents, the change must be applied at all levels of schooling. Essentially, curriculum innovation involves change.

“Changing curriculum and the process of realising it in the classroom is about changing mind-sets of people, and specifically changing the assumptions and values of powerful social groups that shape the cultural selections that make up curriculum content and shape curriculum practices.”

(Callan 2006, p. 8)

It has been contended, that after a quarter of a century of innovation in the Irish school system “little has changed in the culture of our schools or in classroom practice” (Gleeson 2004, p. 105).

The Transition Year is an important example of curriculum innovation in Ireland, despite having developed as a reform ‘mandated from the top’, and despite its optional nature (Jeffers 2008, p. 83). Even as a ‘top-down’ curriculum innovation the year is a prominent example for its notable opportunities for innovation and development. Jeffers (Jeffers 2008, p. 85) has suggested that the Transition Year, while presented as a curriculum innovation, is somewhat of an ‘educational orphan’. Jeffers has taken this view due to the continually changing ‘parents’ of the year. Unlike other Irish curriculum innovations (Leaving Certificate Applied (LCA), Humanities Project, Integrated Science Curriculum Innovation Project (ISCIP)\(^1\) the

\(^1\) Integrated Science Curriculum Innovation Project in 1972 was launched with 8 pilot schools and was a practical laboratory based Science course with emphasis on the teacher as a councillor and a guide, rather than a lecturer ((Crooks and McKernan 1984)
year was not under the auspices of or associated with the Curriculum Development Unit, or the Curriculum Development Centre (Crooks and McKernan 1984). ISCIP was both innovative at a teaching level and at an assessment level, with pupils also undergoing a practical assessment (Crooks and McKernan 1984, p. 7). While schools that have introduced the Transition Year and made it a part of their school cycle have shown innovation, it could be argued that the practices adapted within the year have not (Smyth et al. 2004, Jeffers 2008). There are significant opportunities for curriculum development and innovation in the Transition Year, at both programme and subject level. Crombie White (1997, pp. 78-89) maintains that teachers have become more involved in curriculum innovation than they have ever been. This outlook is promising, and suggests that the Transition Year is a prime opportunity for teachers to innovate in the development of their own curriculum for their subject. However, teachers at second level, even in the Transition Year, frequently work in isolation (Smyth et al. 2004, McDermott and Richardson 2005, Jeffers 2011), and curriculum development and changing practice does not happen without supports (Crombie White 1997). The Transition Year Guidelines refer to a whole school approach to co-ordination, planning, and organisation, with experiential teaching and learning methodologies and situations and diagnostic and formative assessment recommended (Department of Education 1993c, pp. 5-13). In particular the guidelines also heavily recommend that inter-school and parental and community relationships be further developed and nurtured for the mutual benefit of all. In general, schools’ tend not to work with parents and the wider community, and when it does occur it may be “window dressing”, in that teachers are working with parents but “actually extending their own role as parents are seen as a resource to be used to support the professional rather than possessing specialised knowledge in their own right” (Mac Giolla Phádraig 2003, p. 45). Mac Giolla Phádraig found that there was little enthusiasm for parents to be involved on the part of teachers but equally parents are not eager to become partners in the development of school policy. The real innovations begin when both internal and external needs meet (Dalín 1993, p. 166). There is only one real case of curriculum innovation in Science in Ireland, which was ISCIP, as previously mentioned a practical, laboratory-based Science course (Crooks and McKernan 1984, pp. 7-8). The course content was similar to that of the Intermediate Certificate Science Syllabus A, but the teaching and learning
methodologies associated with ISCIP were very different. The focus of ISCIP was on pupil’s experiments, group work and integration of the Sciences. This course ran alongside the Intermediate Science Syllabus A and the courses were examined separately from 1976. The curriculum, while bearing expectations from those favouring change, also faced criticism from those favouring the retention of the ‘status quo’ (Malone 1987). This curriculum innovation did not survive past the nineteen-eighties (Trant 2007, pp. 158-160), and was never allowed to develop beyond a pilot project.

2.5.3 Schools’ resistance to change

Dalin (1993, p. 2) views the school as a learning organisation which can respond creatively to require or demand a new perspective and basic changes in a school’s culture and changes in the environment. A key goal of educational change is to “help schools accomplish their goals more effectively by replacing some structures, programs and/or practices with better ones” (Fullan and Stiegelbauer 1991, p. 15). However, change is difficult, and sustained change within schools does not come easily.

There are different types of change: voluntary and imposed change. Regardless of the type of change, all change involves anxiety and struggle (Fullan and Stiegelbauer 1991, p. 31). Voluntary change typically comes about when “we find dissatisfaction, inconsistency, or intolerability in our current situation” (Fullan and Stiegelbauer 1991, p. 31). Imposed change is typically due to curriculum or departmental reform, and is often met with resistance.

“Teachers are strategically placed to initiate such changes in their work and in particular in their own learning activities. The provision of opportunities for teachers at second-level is driven by the agenda of curriculum change, organisational reform and management concerns”

(Halton 2004, pp. 78-79)
Perhaps one of the reasons that change is so difficult to sustain in second level schools is because second level teachers, “teach in discrete and often disconnected disciplines, and often in professional isolation” (Steele 2011, p. 18).

Dalin (1993, p. 12) suggests that there are four barriers to change: value, power, practical and psychological. Value barriers are described as an opposition to change because the critical players involved do not believe in the values and norms implied in the effort. Power barriers refer to a reluctance to engage in the process of change in case it alters the power dynamic in a negative manner. He notes that changes in the “curriculum are not purely ‘professional issues’” and that these changes may in fact alter the ‘weight’ or provision of resources among the subjects that are taught. A practical barrier as the name suggests, is a general uneasiness about becoming involved in the change process, due to fears or doubts regarding the management of change. Change can often be ‘haphazard’ with unclear decision making, limited resources, inadequate staff development and generally being more demanding than anyone involved could envisage. Finally psychological barriers to change are an unwillingness to engage in the process of change, despite a general agreement with the values and norms of the endeavour, the individual not standing to lose power and no identification of practical issues. Dalin refers to this barrier as ‘rigidity in personality’, possibly due to unpleasant or unsuccessful previous experiences.

Change can challenge, stimulate and enhance a school, but it also has the capacity to frustrate or destroy (Fullan and Hargreaves 1992). Meaningful educational change involves a paradigm shift. Dalin (1993, p. 2) envisions the school as a unit of change, where the demands of society, expectations and learning needs of pupils and teachers meet. The difficulties of this are outlines by Hargreaves et al. (1996, p. 162):

- It is often not obvious who will benefit from the change and how they will benefit;
- If the change is too broad and ambitious it can lead to teachers having to work on too many fronts, if the change is too limited and specific little real change may occur;
- Change may be either too fast, or too slow for the individuals involved to cope with;
- There can be little long-term commitment to change;
Change may be poorly resourced or resources may be withdrawn from the process after the first wave;

A lack of commitment from the key players in the change;

Pupils may not be involved in the change, or it may not be explained to them, thus they cling to the familiar and resist;

Parents oppose change, especially if they are not involved or kept at a distance, influential parents, or groups of parents may negotiate for their children to be ‘protected’ from the effects of change;

Leaders involved in the change can be either too controlling or ineffectual, or view the change to benefit their own personal gain;

Change is often pursued in isolation and is undermined by other unchanged school structures, such as report cards and standardised testing or the change can be poorly co-ordinated or engulfed by parallel changes making it difficult for teachers to focus their efforts.

A lack of change in the school system has caused Steele (2011, p. 3) to state that:

“rather than thoughtful active citizens in a democratic society who might have the capacity for transformation, it is suggested that schools are continuing to train students to be skilled workers and consumers who perpetuate the status quo.”

These difficulties with change, and schools’ resistance to change can have implications for the Transition Year, which is one of the most significant educational ‘changes’ or reforms in the Irish school system (Jeffers 2008). Jeffers refers to the term ‘domestication’, in that schools adapt and shape their Transition Year Programme in order to suit their own needs, and integrate it into their policies and practices (Jeffers 2011, p. 66). Jeffers (2011, p. 66) further argues that domestication implies a ‘taming’, with schools “tending to downplay or even omit aspects of TY that are particularly challenging.” Schools shape and mould the Transition Year to fit their needs, but in resisting change and doing so they may lose some of the most important aspects of the programme.
2.5.4 Continuous Professional Development (CPD)

A wealth of research has indicated that teachers are often entrenched in their practices and resist change (Hoban et al. 1997, Halton 2004, Jeffers 2006, Park Rogers et al. 2007, Tytler 2009). If teachers are to contribute to the ‘learning society’ they must learn how to change their practices, putting their own learning foremost, and at the heart of change. It has been suggested that the key lies in the language of policy documents: the term ‘learning’, rather than ‘education’ symbolises a society built on continuous learning, rather than education, as preparation for work (Halton 2004, p. 68). The OECD review of Ireland’s National Policies for Education (OECD 1991, p. 91) states that “education for a teaching career should be continuing and not seen simply as a preparation for and introduction to it.”

This review led to teachers’ CPD becoming a prominent theme on the governments’ agenda. The White Paper (Government of Ireland 1995) on Adult Education marked the adoption of a policy of lifelong learning and CPD in Ireland. The White Paper (Government of Ireland 1995) sought to ensure that there education and training provision was ‘fit’ and complementarily in order to “ensure that learners can move progressively and incrementally within an over arching coordinated and learner centred framework”.

This has led to far greater provision and emphasis on teachers’ CPD, but these “formal or focused opportunities for teacher learning are generally provider driven with the purpose of supporting a change in curriculum or a change in management, administrative or school policy” (Halton 2004, p. 69). In order for a culture of ‘lifelong learning’ to truly become embedded in this profession, Halton (2004, p. 70) suggests that there needs to be a dramatic shift from provider-driven to participant-led teacher learning opportunities.

Irish teachers have taken up the mantle of the professional (Drudy 2000). Hargreaves (2003, p. 16) notes teachers “can no longer take refuge in the basic premises of the pre-professional age: that teaching is managerially hard but technically simple; that once you’ve qualified to teach, you know the basics of teaching forever.” Thus, often motivating teachers to participate in CPD, other than in sessions related to the curriculum or examination papers, is difficult. Both the teacher and school cultures do not facilitate this (Halton 2004, p. 66). Factors which inhibit teachers’ CPD are cultures of individual teacher autonomy, a lack of tradition of teacher
‘change’, the general rigid structure of the Irish school day and the commonly held view of CPD as an optional add-on for Irish teachers (Jeffers 2006, p. 188). These factors are of significant consequence in the context of the Transition Year. The year offers schools and teachers so much freedom in terms of curriculum design and teaching and learning methodologies. The typical ‘rigidity’ of the Irish school day is not typical of the Transition Year. However, change, and embracing CPD are both difficult, Eisner (1992, p. 162) noted that:

“familiar teaching repertoire provides economy of effort; hence changes in schools that require new content and repertoire are likely to be met with passive resistance by experienced teachers who have defined for themselves an array of routines they can efficiently employ”

In order for CPD to be seen as a worthwhile endeavour for teachers it must have practical classroom applicability. A robust support network is also vital for CPD to be effective (Park Rogers et al. 2007, p. 527). Teachers’ learning proceeds most effectively when situated within school-based professional learning teams, and can be effectively supported through a variety of experiences including reflection on practice, workshops shared discussions and action research, and mentor support (Tytler 2009, p. 1805). However, the individual school has not featured strongly as a “site of teacher learning”. Park Rogers et al. (2007, p. 528) suggests that if the aim of Professional Development is “transformative learning then there must be explicit effort for teachers to experience a sense of cognitive dissonance that challenges both their content knowledge and PCK”

Jeffers (2006, p. 205) recommends that “structured school-based projects involving teachers discussing their observations of each other’s classes can be a powerful forum for teaching and learning”, but also cautions that a delicate balance is required, as the journey from trust to meaningful collaboration is a difficult one. For a genuine professional collaboration to occur between teachers there has to be more than a “contrived cooperation”, where teachers exchange “war stories” or express mutual admiration for each others’ practices. The dialogue must move beyond this point and into the realm of ‘real’ talk about teaching and learning practices.
2.5.4.1 Continuous Professional Development for Transition Year teachers

The initial two phases of the Transition Year Programme had few professional development initiatives for teachers. It was not until the third phase that teacher professional development became a core focus of this new era. This new approach to teacher professional development hoped to encourage “schools to become ‘learning organisations’, in which teachers played an active role” (Jeffers 2008, p. 37). In order for this new teacher CPD programme to be a teacher-led one, a five-person core team\(^2\) was recruited in order to reflect different school types, leadership and personality styles. Jeffers (2008) (who was member of this team) notes that there was no designated team leader, and this model offered a fresh perspective on the typical hierarchical structure of the education system in Ireland at the time. The new Transition Year Guidelines (Department of Education 1993c) set out that schools engagement and participation with the Transition Year must be accompanied by CPD in the form of an in-service training programme. In order to carry out this further programme of CPD a further team of selected teachers were brought together. This extended team comprised of 63 teachers, who formed 15 regional teams. These teachers, who were selected due to their familiarity with the Transition Year, its aspirations and practices, underwent six days training. Once the 15 regional teams were established, pairs within each regional team spent half day briefing sessions in all schools about to embark with the Transition Year Programme. A further programme of four one-day workshops was held by each regional team for the schools in each region. These workshops were aimed at the Principal, Transition Year Co-ordinator, and three teachers from each school. Further workshops were held and materials (Resource Material) were produced from these workshops and distributed to all schools offering the year (Jeffers 2008). Lewis and McMahon (1996) were very positive towards this model of CPD for teachers in their report ‘Evaluation of a Training of Trainers In Service Education Model: The Transition Year in-Career Development Programme’. This model of teachers working on secondment on a regional basis was so successful that a Transition Year Support Team (TYST) was established on the basis of it. This comprised of a 14 person

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\(^2\) The five members of this team were Gerry Jeffers, Eileen Doyle, Mary Anne Halton, Mary Keane and Dermot Quish. This team was known as the ‘Action Team’.
team\textsuperscript{3}, which was in place for the school year 1995-96. Four members of the team were the core team, and the other ten members were regionally based, as in the previous model (Jeffers 2008, pp. 36-49). This model of Transition Year in-service was heralded as a pioneering initiative, and resulted in similar models being applied to subjects such as Civic Social and Political Education (CSPE) and Relationships and Sexuality Education (RSE) (Hyland 1997, p. 182). A large number of schools were visited and the schools and staff were reported to be very satisfied with these visits, which covered programme planning, timetabling, writing, development, implementation, assessment, evaluation (Transition Year Support Team 1998, Jeffers 2008, p. 50). A new programme of support and CPD was initiated in 1998. A Transition Year Curriculum Support Service was set up, which consisted of a national co-ordinator, and five regional members.\textsuperscript{4} Currently the Transition Year is supported by the Professional Development Service for Teachers (PDST), with Michael O’Leary as the National Co-ordinator. This service continues to provide CPD for principals, teachers and Transition Year Co-ordinators who are engaging with the year.

\textsuperscript{3} The core four-person team was made up of Mary Anne Halton, Eilish Humphries, Gerry Jeffers and Dermot Quish. The ten regional based team members were Bridie Corkery, Rachael Keogh, Ruth Marshall, Alec MacAlister, Karl O’Connell, Michael O’Leary, Lynda O’Toole, Bill Reidy, Geraldine Simmie, and Patsy Sweeney.

\textsuperscript{4} The TYCSS team consisted of a national co-ordinator: Gerry Jeffers and five regionally based team members: Denise Kelly, Michael O’Leary, Lynda O’Toole, Geraldine Simmie, and Patsy Sweeney.
2.6 Summary

The Transition Year is a radical transformation in terms of practice, school culture, curriculum innovation and requiring change with in schools and their staff and pupils.

As Emer Smyth et al. (2004) noted in their study ‘The Transition Year Programme An Assessment’:

“A successful Transition Year programme has a number of features: a whole school commitment to the programme; time for co-ordination activities and for co-operation among teachers; varied programme content, covering a range of different subject areas; a structured exposure to the world of work; the use of more innovative teaching methods and forms of assessment and accreditation; and on-going evaluation and redesign of the programme within the school.”

The year needs to be viewed in the broad context of schooling, not just as an isolated year, as the year has a significant impact on almost all other aspects of school life (Smyth et al. 2004, Jeffers 2007b;a;2008;2011).
CHAPTER 3: LITERATURE REVIEW
3.1 Introduction

There is an immense body of research in the area of Science education. This chapter is concerned with the pertinent areas for this study, namely the importance of Science, the uptake of the subject, the specifics issues that hinder the learning of Science, how pupils learn for Science, assessment and the teaching methodologies employed for teaching the subject.

3.2 Importance of Science

The importance of Science both in society and for the workforce has long been the focus of the media and government bodies at both international and national level. There is a belief that a skills shortage in the field could has serious impact on both the global economy and Ireland’s own economy. Smyth and Hannon (2006) note that there has been international concern regarding declining numbers choosing to study Science subjects, both at secondary and tertiary level. Biology, Physics and Chemistry have all experienced considerable decline since the 1980’s, with Biology being the only Science subject returning to its initial starting point in Ireland. “This trend is likely to have significant consequences for young people’s educational and occupational choices on leaving school” (Smyth and Hannan 2006, p. 303). While many countries are experiencing difficulties with engaging students in the study of the physical sciences, it is not a universal pattern. It appears to be strongly correlated with the level of economic advancement of any given country (Schreiner and Sjøberg 2005), with Science being less popular in more developed countries.

Furthermore the importance of Science for citizenship has been highlighted more and more frequently. “Recent rapid changes in the world economy have highlighted the need for a workforce that is scientifically literate.” (Smyth and Hannan 2006, p. 303) We are currently living in an age of ‘Science and Technology’, which permeates through our homes and everyday lives. We are continuously bombarded with media reports containing Scientific content and presented with issues that merit debate in our society (such as genetic engineering, future energy sources), all of which presents challenges regarding desirability, safety, and the effect on society. There are political, ethical and economic issues to be considered, leading to informed action
It is very difficult to have an informed public debate unless the public are scientifically literate.

The report to the Nuffield Foundation by Osborne and Dillon (2008) noted that school Science for all can only be encouraged and justified if it offers “something of a universal value” for all, not just to those who are to become future scientists. The authors also acknowledged that there has long been a consensus that Science is an important and valuable school subject. Yet there has been “little debate about its nature and structure” (Osborne and Dillon 2008, p. 7). School Science curricula have continued to follow the pre-existing forms that have always been there. Science for society has not been developed, but rather a foundational Science course focusing on facts and figures, aimed at those who are to become scientists. Thus, there is “a strong negative correlation between students’ interest in science and their achievement in science tests” (Osborne and Dillon 2008, p. 7). There is often an assumption that if an individual knows enough Science that they will be able to apply it in life situations (Bybee and McCrae 2011). Driver, Newton and Osborne (2000) state that:

> “the claim ‘to know’ science is a statement that one knows not only what a phenomenon is, but also how it relates to other events, why it is important and how this particular view of the world came to be. Know any of these aspects in isolation misses the point.”

The PISA 2006 study (OECD 2007, p. 20) defines scientific literacy and develops its science assessment tasks and questions within a framework of four interrelated aspects, namely the:

- Knowledge or structure of knowledge that students need to acquire (e.g. familiarity with scientific concepts);
- Competencies that students need to apply (e.g. carrying out a particular scientific process);
- Contexts in which students encounter scientific problems and relevant knowledge and skills are applied (e.g. making decisions in relation to personal life, understanding world affairs); and
- Attitudes and dispositions of students towards science.
The philosophy underlying the PISA assessment of scientific literacy is rooted in a Science, Technology and Society (STS) and context-based approach (Cosgrove et al. 2002).

The core competencies that constitute scientific literacy are derived from the ability to draw upon scientific knowledge and processes within different contexts. Duschl and Osborne (2002) note that there has been a “failure to adopt curriculum and instruction that integrate the social and cognitive aspects of engaging Science enquiry”.

Reading, writing and communication are all critical practices for participation in a global society (Krajcik and Sutherland 2010). Traditionally reading is a constructive art, but this is not always so when reading scientific text. School text books present science as a truth, with little to no argumentative text (Penney et al. 2003). Norris et al. (2009) caution that the media do not always portray the epistemology of Science accurately. When reading a novel, the reader is only required to be receptive to the information. However, a piece of scientific text also requires the reader to engage in reflection and critical thinking. Science education does not always appear to explicitly develop critical and creative thinking skills, both of which are important in the work of a scientist. Montgomery (2004, p. 1) notes that “science exists because scientists are writers, are speakers.” Science is very much a shared form of knowledge.

“If data falls in the forest and no one hears it… Research that never sees the dark of print remains either hidden or virtual or nonexistent. Publication and public speaking are how scientific work gains a presence, a shared reality in the world”

(Montgomery 2004, p. 1).

The facts of the matter are that scientists read for 553 hours per year and 58% of scientists’ time is spent working on/in communication (Osborne 2010). Often both the public and pupils fail to see the relevance of scientific research. Traditional school science frequently fails to tackle current and relevant issues (Osborne 2002, Childs et al. 2010). Science is a subject that is constantly changing and evolving. If teachers are unable to appreciate and adapt to this, their pupils may be left with an
unrealistic view and understanding of the value and use of Science in our everyday lives.

In their report to the Nuffield foundation Osborne and Dillon (2008) recommended that:

- The primary goal of science education across the EU should be to educate students both about the major explanations of the material world that science offers and about the way science works. Science courses whose basic aim is to provide a foundational education for future scientists and engineers should be optional.

- More attempts at innovative curricula and ways of organising the teaching of science that address the issue of low student motivation are required. These innovations need to be evaluated. In particular, a physical science curriculum that specifically focuses on developing an understanding of science in contexts that are known to interest girls should be developed and trialled within the EU.

- EU countries need to invest in improving the human and physical resources available to schools for incoming students, both about careers in science – where the emphasis should be on why working in science is an important cultural and humanitarian activity – and careers from science where the emphasis should be on the extensive range of potential careers that the study of science affords.

Science is of vital importance on a global and national level for economic prosperity and progress. However, progress cannot happen without discourse on the subject and for this a scientifically literate population is necessary.
3.3 Uptake of Science/enrolment in Science

There has been widespread concern, both internationally and within the Irish context regarding the declining numbers of pupils studying Science at both second and third level education. It is believed that this continued cry of falling enrolments in Science has manifested itself at second level (Kelly 1986, Woolnough 1994;1996, George 2000, Smyth and Hannan 2002, Lyons 2006).

The primary concerns of educators and government bodies are related to the need to generate and develop scientific literacy among the population, and to attract both sufficient numbers and high achieving pupils into Science-related fields, and to create equity in terms of participation in Science courses and careers. The Task Force Report (2002) noted that the economic future of the Ireland depends on this.

The body of research conducted in the area of uptake and enrolments in Science and Science-based courses and careers indicate that there are a number of factors which affect uptake. These factors can be broadly categorised into school- (external) and pupil-based (internal) factors.

Much research regarding pupils’ subject choice has been primarily conducted under the individual choice framework (i.e. examining the pupil-based factors). This model emphasises the role of career value, interest and performance expectations in ‘shaping student decisions about subject choice’ (Milner et al. 1987, Smyth and Hannan 2006, p. 304, Reardon et al. 2010)

Essentially, pupils are driven to take subjects that they believe to be useful for their future careers, which they find interesting and in which they believe they will perform well academically (Milner et al. 1987, Cleaves 2005, pp. 479-480, Lyons 2006, Smyth and Hannan 2006, Reardon et al. 2010). This model, does acknowledge the role of parental or teacher influences, but neglects to take into account external factors such as school subject provision, the manner in which the subject are offered to the pupils and the school’s timing of these decisions.

Other factors such as the pupils’ socio-economic status and gender have also been acknowledged to play a part in the uptake of Science subjects (Dekkers et al. 2000, Smyth and Hannan 2002, Lyons 2006, Smyth and Hannan 2006). Pupils from a higher socio-economic background are more likely to take Science subjects, in particular, the Physical Sciences. Gender is also widely acknowledged as playing a significant role in the uptake of Science subjects. Typically greater proportions of
male pupils have been identified as taking the ‘hard’ Science subjects such as Physics and Chemistry, with female pupils being more likely to take Biology. In Ireland the traditional gender gaps have remained very much present in Physics and Biology, with Physics remaining dominated by male pupils and Biology by female pupils. However, the gender gap in Chemistry has disappeared, and the subject has become increasingly feminised, whereby the female pupils have overtaken the males in this area (Smyth and Hannan 2006, p. 305). Pupil-related factors discussed in the literature have indicated that the marked gender differences exhibited are experienced even when the pupils’ socio-economic background and their attitudes to the subjects are controlled for. The more academically able pupils have a greater uptake of Science subjects, particularly for Physics and Chemistry. In addition, pupils whose parents have been well educated are more likely to take a Science subject (Milner et al. 1987, Smyth and Hannan 2002;2006).

In the Irish context all of the factors mentioned previously play a role in pupils’ uptake of Science subjects in school, and beyond. However, external or school based factors are likely to have a greater effect on pupils’ subject choice in Ireland, as the country is somewhat unique in that Science is not compulsory at any stage of pupils’ second level education (Smyth and Hannan 2002).

The Junior Cycle in the Irish education system is recognised as having a number of factors that are influential on pupils’ later subject choice (Smyth 1999, Smyth and Hannan 2002;2006). These are:

- Approaches to ability grouping;
- Timing of subject choice;
- Type of subjects chosen at Junior Cycle;
- The school culture and climate;
- Provision of Science subjects.
Initially the grouping of pupils according to their ability has been found to have implications for subject choice at senior cycle (Smyth 1999, Smyth and Hannan 2002;2006). Pupils in lower ability bands tend to have less access to certain subjects and are not encouraged to take the ‘more difficult’ subjects. Studies have found that if schools stream their pupils according to ability, this affects the pupils’ subject choice. Pupils in these schools are more likely to take Physics, which reflects the greater use of streaming in single-sex male and Vocational schools, which have higher uptake of Physics, than in other schools.

Smyth and Hannon (2006, p. 313) found that the timing of when pupils made their subject choice decisions at lower secondary school had an effect for male pupils in particular. Earlier subject choice was found to promote a greater uptake of Physics and lower uptake of Biology for male pupils.

Pupils who have not taken Science for their Junior Certificate are less likely to take a Science subject for their Leaving Certificate, particularly one of the Physical Science subjects. Research indicates an affinity between Physics and vocational subjects (e.g. Metalwork, Woodwork, Technical Drawing), with pupils who take these subjects being less likely to take Biology and more likely to take Physics. Female pupils who do not take these vocational subjects are more likely to take the élite Science subject, Chemistry, for senior cycle.

Pupils who have experienced more negative interactions with their teachers are less likely to take a Science subject for their Leaving Certificate, leading to the belief that a positive school climate is more likely to foster a better academic self-image and promote the uptake of Science subjects at senior cycle.

There is a gender imbalance in the provision of Junior Certificate Science, with many single-sex female schools placing Science against subjects such as Home Economics and this competition between the two subjects means that lower numbers choose science than the national averages. Schools that offer Science as a compulsory subject at Junior Certificate are more likely to be single-sex male secondary schools and least likely to be single-sex female secondary schools. These discrepancies between the sexes lead to fewer girls taking Science at senior cycle as it is either not offered or they have not experienced Science at the Junior Certificate level (Smyth and Hannan 2002).

In keeping with the lower second level factors that effect pupils’ uptake of Science subjects at senior cycle, influences are also found at upper second level.
These factors are:

- Provision of Science subjects,
- How subjects are provided.

The schools’ provision of Science subjects at senior cycle has been found to affect the uptake of Science subjects for Leaving Certificate. The majority of schools provide Biology at Leaving Certificate level, but a significant proportion of pupils are not offered the opportunity to study Physics or Chemistry\(^5\). The ASTI (2010) claim that Chemistry is offered in 90% of schools and that Physics is offered in 84%, with Biology being offered in nearly all schools (98%). This effect is more profound for pupils in designated disadvantaged schools, or (for Physics only) in single-sex female schools (Smyth and Hannan 2002, p. 232-233).

Schools also differ in when they require their pupils to choose their subjects for senior cycle and how the subjects are offered. Subjects may be offered in blocks (e.g. Biology, Business, Accountancy and Home Economics) on a timetable; this can lead to gendered subject choices, particularly when two Science subjects are offered in the same block (i.e. Biology versus Chemistry), with male pupils more likely to take Chemistry and female pupils more likely to take Biology. Therefore subjects which are considered to be more ‘core’ or are offered throughout a number of different blocks have a greater chance of being chosen (Smyth and Hannan 2006, p. 318).

In addition to the school-based factors mentioned, the pupils’ own attitudes also have a considerable effect on their subject choice for Senior Cycle. These attitudes can be examined broadly, and can be considered to include their academic self image, career aspirations, and perceptions of the subject. The pupils’ experiences of various approaches to Science teaching can affect these attitudes. Pupils’ results in their Junior Certificate examination are considered to be an indicator of how likely they are to take a Science subject for senior cycle, which relates to the effect of the pupils’

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\(^5\) In 2000 in Dáil Eireann, in response to a Parliamentary Question, the then Minister for Education and Science, Dr. Michael Woods, stated that based on 1999-2000 enrolments, the total number of schools providing the Leaving Certificate programme was 730. Of these, 162 did not provide physics, 202 did not provide chemistry, and 638 did not provide the combined subject of physics and chemistry. In percentage terms, this meant that 22% of schools did not provide physics, 28% did not provide chemistry, and 86% did not provide the combined subject physics and chemistry. http://historical-debates.oireachtas.ie/D/0526/D.0526.200011210045.html
academic self image of their self-efficacy. Smyth and Hannon (2006, p. 316) found this effect to be more “marked” for female pupils.

3.4 Attitudes towards Science

The poor uptake of Science subjects, in particular the Physical Sciences, across Europe, and most westernised countries have led to much research into attitudes towards Science. Osborne et al. (2003, p. 1049) note that this body of research has been a “substantive feature” of the work of the Science education research community for the last half century. In order to fully establish the findings of this work it is imperative to first examine what we mean when we discuss ‘attitudes towards Science’. Attitudes are notoriously difficult to define, not consisting of one singular construct, but of many sub-constructs, contributing, in varying proportions towards individual’s attitudes towards Science. Osborne et al. (2003, p. 1049) note that the “concept of an attitude towards science is somewhat nebulous, often poorly articulated and not well understood.”

Klopfer (1971, cited in Osborne 2003) characterized set of affective behaviours in science education as:

- The manifestation of favourable attitudes towards science and scientists;
- The acceptance of scientific enquiry as a way of thought;
- The adoption of ‘scientific attitudes’;
- The enjoyment of science learning experiences;
- The development of interests in science and science-related activities; and
- The development of an interest in pursuing a career in science or science related work.

An alternative definition is provided by Kind et al. (2007), who define an attitude as the feelings an individual has about an object, based on his or her knowledge and belief about that object. This belief is based on a model of an attitude as consisting of three components: cognition, affect and behaviour. Attitudes do differ from affects (such as general moods and behaviour etc) (Kind et al. 2007, Barmby 2008, p. 1077).
The sub-constructs that combine to form the construct of pupils’ ‘attitudes towards Science’ according to the work of Kind et al. (2007) are:

- Learning Science in school,
- Practical work in Science,
- Science outside of school,
- Importance of Science,
- Self-concept in Science,
- Future participation in Science.

Osborne et al. (2003, p. 1054), in their review of the literature in this field go a step further in synthesising the research and outlining the components of ‘attitudes towards Science’, which are:

- The perception of the Science teacher;
- Anxiety toward Science;
- The value of Science;
- Self-esteem at Science;
- Motivation towards Science;
- Enjoyment of Science;
- Attitudes of peers and friends towards Science;
- The nature of the classroom environment;
- Achievement in Science; and
- Fear of failure on course.

If this is the case then it can be assumed that pupils’ attitudes towards Science are changeable with the correct application of teaching and learning styles and subject content. Despite the difficulty in comparing pupils’ attitudes towards Science across the body of research, due to a lack of standardised definitions and measurement instruments, definite patterns have emerged from the research. The main patterns that have emerged, which have implications for classroom practice, are: pupils’ perceived difficulty of the subject, pupils’ beliefs regarding the relevance of the subject, the perceived heteronomous nature of Science, pupils’ self-efficacy in Science, the effective teaching of Science, the decline of positive attitudes over time and pupils’
It is well established that pupils perceive Science subjects as difficult, in particular the Physical Sciences (Department of Education and Science 2002, Politis et al. 2007). The work of a scientist is viewed as “difficult, complicated and boring, as well as poorly paid.” (Department of Education and Science 2002, p. iv) Reviews of grading of Irish Leaving Certificate examinations, which compared the Science subjects with others, found this to be true; Science subjects are more difficult to achieve a high grade in (Smyth and Hannan 2006, Association of Secondary Teachers Ireland 2010). This is perhaps linked to pupils’ self-efficacy or belief in their own ability to do well in Science. Cheng et al. (1995) found the grades pupils’ achieved at GCSE in Science and Mathematics were significant factors in whether pupils subsequently took the Physical Sciences.

Research also indicates that pupils believe there to be a lack of relevance between their lives and school Science (Bennett and Hogarth 2009). Much of the work by Bennett and Hogarth (2009) suggested that there is little overlap between the pupils’ perceptions of Science and their perceptions of their own identities.

Studies have indicated that pupils do not believe that Science offers opportunity for autonomy in the classroom and within their own learning. Research has shown that pupils have expressed a desire for Science lessons that force them to think, discuss topics, and have extended investigations and further practical work. Kessels et al. (2006) reported that pupils believed subjects such as English offered the most opportunity for them to behave as autonomous agents. Science lessons, in the main, do not focus on dialogue or argumentation, yet this is the very foundation of Science (Osborne et al. 2003). The ROSE report indicated that pupils want to make use of their individual talents and want to be personally involved in their future careers. They value a degree of autonomy, and do not seek merely financial or other extrinsic rewards, social and interpersonal relations are considered just as valuable (Matthews 2007). This has implications for the teaching and learning of Science, and is associated with the effective teaching of the subject, whereby the teacher makes these connections explicit, providing ample opportunity for discussion and argumentation in the Science classroom.

Monk and Osborne (2000, p. 111) characterised effective teaching as teachers having positive attitudes themselves, a high level of involvement, a high level of personal
support, the use of a variety of teaching strategies and unusual learning activities and strong positive relationships with the class. Chang and Cheng suggest that “science instruction in secondary schools should … put more emphasis on building students’ self-confidence and cultivating their interest in science” (2008, p. 1194).

A report by Walshe (2009) in the Irish Independent noted that:

“Maths and science teachers are not "passionate" enough about their subjects, according to secondary school students… By contrast, teachers of English and other subjects got top marks from students who took part in a research study undertaken by Ipsos MORI.”

Bennett and Hogarth (2009, p. 1996) suggest that enthusiastic teaching, specialist teachers and the provision of good information about the “value and flexibility” of Science qualifications can significantly improve attitudes and the uptake of Science. The content that is taught can also have an effect it appears. Both the ROSE and PISA studies (Matthews 2007, Bybee and McCrae 2011) have indicated that pupils want to learn about topics such as health, sex, genetics, natural disasters, the origin of life, space and the universe, essentially, topics that are central to them and their lives. Matthews (2007) suggests that “if one wants to attract more young people into science it is essential to engage them with the human context of science”. Effective teaching for Science will be discussed further, but it is suffice to say that the research indicates that the experiences of pupils in the school Science classroom has a significant effect on their attitudes towards the subject.

The main body of research in the area of pupils’ and students’ attitudes towards Science indicates that positive attitudes decline over time, and school experiences (Bennett and Hogarth 2009, p. 1078). Pupils’ “attitudes towards science become less positive” as they get older. “This decline manifests itself in the development of more negative views around science in schools” (Department of Education and Science 2002, p. 47). The evidence points to the fact that pupils’ attitudes towards Science declines most sharply in their early years of second level education (Department of Education and Science 2002).

Gender is a factor which permeates throughout all of the other factors affecting pupils’ attitudes towards Science. Female pupils are more negatively disposed to Science and careers in Science than their male counterparts (Schreiner and Sjøberg
In addition the decline in positive attitudes over time is more pronounced for female pupils. They perceive Science subjects, in particular the Physical Science to be more difficult than do male pupils, and also are more strongly disposed towards subject where they see themselves as autonomous agents, of which they do not believe Science is one (Department of Education and Science 2002, Osborne et al. 2003, Kessels et al. 2006, Bennett and Hogarth 2009).

The research indicates that pupils have an appreciation of the value of Science outside school, but that this appreciation is not reflected in pupils’ enjoyment of Science in school or in their ambition to become scientists (Schreiner and Sjøberg 2005, Matthews 2007, Bennett and Hogarth 2009, p. 1977). In fact it is attitudes towards school Science that decline, not pupils’ attitudes towards ‘real’ Science or its usefulness. These attitudes are more stable, remaining mainly positive throughout the pupils’ schooling (Osborne et al. 2003). The body of work on pupils’ attitudes towards Science ultimately suggests that pupils like Science, and see the importance of and value the subject outside of their schooling, yet very few want to become a Scientist.

3.5 Teaching and Learning in Science

It has been argued that scientific knowledge is different from that of everyday knowledge (Leach and Scott 2000). Science is a complex and abstract subject, often resulting in it being viewed as difficult, boring, and unloved (Donnelly 2003, Chiu 2005, Sheehan 2010). Teachers play a crucial role in the teaching and learning of Science, and the approaches used can influence their pupils’ opinions, attitudes, and interest towards the subject. Therefore, it is of vital importance that the teaching style is appropriate for the learner’s needs, and the objectives of the lesson. In order for the teacher to address appropriately the learner’s needs, the specific issues with the learning of Science must be addressed.

3.5.1 Difficulties with Learning Science

Science, in particular the Physical Sciences, are regarded as difficult by researchers, teachers, educators, and pupils alike (Department of Education and Science 2002,

- The abstract nature of the subject;
- Pupils’ level of cognitive development;
- The symbolic and representational nature of Science;
- Three levels of learning (Macroscopic, microscopic and symbolic);
- Working memory/Information overload;
- Level of mathematics;
- Complexity of learning tasks;
- Lack of practical laboratory work;
- Issues with communication and language;
- Lack of discussion;
- Pupils’ and teachers’ misunderstandings and misconceptions regarding certain fundamental scientific concepts and principles.

Difficulties have been identified in Biology (Water transport phenomena, genetics) (Johnstone and Mahmoud 1980, Reid 2008), Physics (Electricity, Energy concepts, wavelength and frequency, mechanics and dynamics) (Zapiti 1999) and Chemistry (Particulate nature of matter, Formulae and equations, Equilibrium, Organic Chemistry, Volumetric analysis) (Pinarbasi and Canpolat 2003, Johnstone 2006, Childs and Sheehan 2009). The ROSE (Matthews 2007) study indicated that topics such as atoms and molecules, how plants grow and reproduce and electricity were topics which were given the lowest interest ratings by pupils. Interestingly these are some of the primary topics considered to be conceptually difficult throughout the research in this area (Redish 1994, Reid 2008, Sheehan 2010). These difficulties with Science lie both in the nature of the subject and in how humans learn.

### 3.5.1.1 Nature of Science

Johnstone (2000, p. 10) has argued that we present Science and Chemistry in an ‘apparently’ logical way, which while logical to chemists, and those who develop syllabi, is conflicting with what is known about how we learn (the psychological).
Many ideas in Science are abstract and the subject can be perceived as a body of knowledge and facts to be learnt, with little argumentation, discussion or regard for how this knowledge was generated. This is the ‘traditional view’ of the nature of Science (Murphy et al. 2007). It is the abstract nature of the physical sciences that makes them so difficult for students to grapple with, which in turn can turn pupils off the subjects and create a negative attitude (Redish 1994, Johnstone 2006). The image presented in Figure 3.1 illustrates the complexity of Science and the difficulty for learners as they grapple with the subject.

Figure 3.1: Three domains of representation in the Physical Sciences
Johnstone (1991;2010) proposed that the Physical Sciences can be represented in three domains, as illustrated in Figure 3.1. The domains are the macro and tangible: what can be seen, touched and smelt; the submicro (molecular and invisible): atoms, ions, molecules and structures; and the symbolic and mathematical: symbols, formulae, equations, molarity, mathematical manipulations and graphs. There is no hierarchy in this model, and in lessons Science teachers frequently dart from one corner of the triangle to the next, with little regard for the impact that this creates for pupils’ cognitive processing of the topic. The majority of what we encounter in the world is macro and tangible, we attempt to make Science ‘macro and tangible’ through practical work and laboratory sessions. However in order to fully understand many fundamental scientific concepts one must move through the submicro (molecular and invisible) and the symbolic and mathematical corners of the triangle. Therein lies a deep-seated issue with how pupils learn Science; it is of vital importance when presenting material that it is in line with how we learn. A simultaneous introduction of all the aspects of this triangle can lead to serious cognitive conflict for the pupil, resulting in the subject becoming intangible and difficult.

3.5.2 How pupils learn

“Learning as defined by Robert Gagne (1985), is a process that leads to a change in a learner’s disposition and capabilities that can be reflected in behaviour. As human beings we perceive and process information every waking minute. Some of this information is filtered out and some is incorporated into what we know and remember.”

(Gagne 2004, p. 3)

Learning is a multi-faceted thing. Every pupil will have their own method of learning and their own style. With this in mind, teachers must be innovative when designing their lessons, as the syllabus committees must be when designing a curriculum. Shipman (2000, p. 541) reminds us that “as we sometimes seek to cram more and more content into our courses, we often forget that teaching scientific habits of mind is as important as teaching the subject”. All pupils’ styles must be included and
lessons must incorporate a wide variety of teaching and learning styles and techniques.

Educators are advised to turn away from the traditional didactic teaching styles and to embrace a complex and comprehensive learning experience for the pupil. The Department of Education and Science Statement of Strategy 2005-2007 (2006) describes education as a means of enabling all individuals to reach their full potential. In order to fulfil the above goals, we must become aware of how pupils learn.

The following diagram (Figure 3.2) by Krajcik illustrates a commonly held constructivist view on how pupils learn.

Figure 3.2: Diagram of processes involved in learning as proposed by Krajcik (Krajcik 1994 cited in Gabel 1999, p. 552)

Given the abstract nature of Science, how the material is presented to pupils and how they learn is of paramount importance when teaching the subject.
Practical work is frequently presented as the primary mode of learning in Science, but it is vital to proceed carefully in using practical work, rather than having a “trendy” emphasis on it (Glynn et al. 1991, p. 3). When correctly carried out demonstrations and practical activities

“not only orient students’ attention toward learning from them because they know that they will be assessed, but also they improve the problem-solving capabilities of the students because they help them switch between various forms of representing problems”

(Kampourakis and Tsaparlis 2003, p. 321)

Typically laboratory instruction has been viewed as a vital component of Science, as basic knowledge was traditionally transmitted in a didactic fashion through classroom or lectures, the view was taken that only laboratory practicals can illustrate how the knowledge was obtained (Elliott 2008). Traditional cook-book or recipe style practical work leaves “little room for creativity or contextualisation” and is usually in place in order to verify an already known quantity or theory (Mc Donnell et al. 2007). Hodson (1993) suggested for aims of practical work:

- To teach laboratory skills;
- To enhance the learning of Scientific knowledge;
- To give an insight into scientific method and develop expertise in it;
- To develop scientific attitudes (particularly open-mindedness, objectivity and a willingness to suspend judgement);
- To motivate pupils by stimulating interest and enjoyment.

One must be careful in how practical work in Science is presented in the curriculum and taught, as Matthews (2007, p. 87) says “even the most mundane of practical tasks” will readily awaken a pupil’s interest, it is much more difficult to convert this into long term motivation. Therefore, rather than the cookbook style approach, practical work should be an integral component of a Science course, augmenting theory and promoting understanding of science concepts.

Science has a special role as practical work is something that not every subject has the chance to offer. Science, and particularly Science in Transition Year, should be
fully utilised in all that it has to offer in terms of practical work in order to motivate and stimulate pupils’ interest in the subject.

### 3.5.3 Theories of learning for Science

There are many schools of thought regarding how pupils learn, however they are not all relevant for the learning of Science. In particular the work of Piaget and Vygotsky has been cited in the research as having particular implications for the teaching and learning of Science. Science is complex (Monk 1994, Chiu 2005), and much of what is to be learned in Science is abstract and falls into the sub-micro and symbolic domains of Johnstone’s triangle. The simultaneous introduction of all three corners of this triangle when teaching a topic can lead to a cognitive conflict, which implies that Piaget’s model of cognitive development is central to the understanding and learning of Science.

#### 3.5.3.1 Piaget

There have been many educational psychologists over the years, each constructing their own theory on how we think and learn. Of these theorists Jean Piaget has been hugely influential, particularly in the area of Science education. He was concerned with learning as a process, and with how knowledge grows and basic human tendencies. Piaget believed that humans inherited basic tendencies: the tendency to organise and the tendency to adapt. By organisation he meant how we “systemize and combine processes into coherent general systems” or “schemes” and adaptation was defined as our “tendency to adjust to the environment” (Snowman and Biehler 2003, p. 37, Woolfolk 2004, p. 30).

Piaget was also concerned with the question of how knowledge develops. He aimed to explain cognitive development from birth to adulthood in the form of four stages, as illustrated in Figure 3.3 below.
Piaget believed that everyone passed through these four stages as children. Each particular child could vary in the rate at which they passed through each stage, but there was the same basic sequence for all (Snowman and Biehler 2003).

However, there have been criticisms of Piaget’s theory and it is important that they are noted. An enduring aspect of Piaget’s theory is that adolescents do learn and reason differently than younger children but it has been said that Piaget overestimated adolescents’ formal thinking capabilities, as it “has been found that only 30 to 40 percent of adolescents attained formal operations” (Henson and Eller 1999, p. 58).

Piaget worked with a select group of children in his studies and the accumulating evidence is that Piaget’s scheme is too rigid: many children manage concrete operations earlier than he thought, and some people never attain formal operations (or at least are not called upon to use them). Educational theorists have also remarked that Piaget did not take into account the multicultural background that is found in classrooms today. These cultural and demographic differences may have an effect on the developmental rate of pupils in classrooms around the world.
“Herman Epstein (1980) found that among a group of ninth graders [age 14], 32 percent were just beginning the concrete operational stage, 43 percent were well within the concrete operational stage, 15 percent were just entering the formal operational stage, and only 9 percent were mature formal operators.”

(Snowman and Biehler 2003, p. 45)

The implications of Piaget’s theories for education led to discovery learning being strongly encouraged. Piaget and those strict followers of Piagetian theory appeared quite averse to the idea of instruction. While this view has been modified, the view that teachers should allow active hands-on manipulation of concrete materials, rather than a set curriculum sequence, still holds. This can be applied into the classroom through building Piagetian tasks into the curriculum/lessons (Good and Brophy 1990, p. 65).

In terms of Science education, Piaget’s theories have been highly influential and have generated numerous studies, in particular the CASE (Cognitive Acceleration through Science Education) study by Shayer and Adey. Piaget believed that students should reach the formal operational stage of thinking by the late adolescence or early adulthood. The CASE study explored how students’ cognitive ability could be accelerated, through using Science education as a vehicle. The project sought to use science education as a method by which to accelerate students ‘general thinking ability’ or ‘general intelligence’. The foundations of the CASE project are rooted in the educational theories of cognitive development of Piaget and Vygotsky. The study recognises Piaget’s stages of cognitive development and seeks to improve pupils cognitive development, i.e. the change from concrete thinking to formal operational thinking, through specifically designed Science lessons. The CASE project has improved students GCSE results in Science, but their results also improved in both Mathematics and English. It is unusual to see such a transfer of learning to other subjects (Shayer and Adey 1981, Adey et al. 1989, Adey 1999).

Based on Piaget’s cognitive theories, an instrument to analyse curriculum materials was developed, as were group tests of cognitive development. Through these instruments it was discovered that there was a significant mismatch between the

The area of cognitive levels in students and its implications for Science teaching and learning has been most thoroughly researched by Shayer and Adey in the U.K. through the Cognitive Acceleration through Science Education (CASE), and more recently in chemistry education in Ireland through the work of Childs and Sheehan (Childs and Sheehan 2009, Sheehan 2010) in second and third level education and McCormack (2009) in primary and early second level Science education. Both bodies of work in the Irish context have been based on the work of Shayer and Adey and the CASE programme. Shayer and Adey (1981) found that “there is a chasm set between the expectations expressed in the curriculum objectives and the cognitive skills of many pupils.” Given the nature of the Physical Sciences, it has been found both in the U.K. and more recently here in Ireland that the curriculum and curriculum materials being used to teach pupils in the Sciences make major demands on pupils in terms of their cognitive abilities. The curriculum and textbooks deal with many difficult and abstract concepts and ideas that pupils may not be conceptually able for, while the assessment promotes rote learning of these abstract and difficult concepts (Shayer and Adey 1981, Adey \textit{et al.} 1989, Adey 1999, Shayer 1999, McCrudden 2008, McCormack 2009, Sheehan 2010). Achieving the formal operational stage of thinking in Science is very important for pupils wishing to grasp the full abstract nature of Science. For example

Figure 3.4: The ‘five pilliars’ of CASE wisdom (Adey 1999, p. 8)
“if you are going to see connections between science concepts (say to respiration and photosynthesis), you need to be able to hold in mind at once the important characteristics of each and also to be able to compare them”

(Monk and Osbourne 2000, p. 161)

Hence Piaget’s work in the field of cognitive development is of great importance to the field of Science education.

3.5.3.2 Vygotsky

Lev Vygotsky was a highly influential psychologist whose physiological and educational theories on child development were pioneering. Vygotsky’s theory of cognitive development is often referred to as a sociocultural theory, as he believed that social interaction was the primary cause of cognitive development. This theory proposes that every culture passes on psychological tools to its members and their descendants. These tools allow us to interact with and explore the world around us. He noticed that children begin to learn from others around them, i.e. those in their social world. This interaction then builds up a source of all the child’s concepts, ideas, attitudes and skills. Unlike Piaget, who believed that what the learner does on their own is what alters and accommodates existing schemata, Vygotsky believed that it is what learners and others (their peers, adults, teachers) do together that promotes learning. Who the learner spends their time with is what influences how they think of the world. Using this view, teachers can then develop lessons, syllabi or curricula that encompass the learner’s culture and their socio-cultural experiences (Borich and Tombari 1995, p. 86).
Vygotsky believed that this life long process of development was dependent on social interaction and that social learning actually leads to cognitive development. This phenomena is called the Zone of Proximal Development. Vygotsky describes it as “the distance between the actual development level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers” (Riddle 1999).

Vygotsky thought that when instruction towards a problem was given, aimed slightly above the child’s level, they would rise to the challenge, with some assistance. However if the child is left with a problem to solve by themselves they often fail, thus showing, that with some instruction and leading questions the learner progresses better than on their own. Vygotsky referred to this difference, between what a child can do on their own and what a child can do with some assistance, as the ‘zone of proximal development’

“Instruction is good, Vygotsky said, only when it proceeds ahead of developmental level. Instruction must awaken and bring to life those functions that are in the process of maturing, that is those in the zone of proximal development” (Gage and Berliner 1998, p. 111).

Vygotsky believed that “all higher psychological processes and structures (such as science concepts) originate on the social plane” (Monk and Osbourne 2000, p. 44). What Vygotsky referred to as the Zone of Proximal Development is meant as a measure of what the pupil can do by themselves and what they need assistance with. It is through this interaction that learning takes place, the social interaction between the student and the learner. Studies examining Science education and Vygotsky have argued that the social constructivist perspective on teaching and learning Science provides an alternative to personal constructivist accounts of learning (Abell and Lederman 2007, p. 41). Thus, recognising the importance of social discourse in the Science classroom, if pupils are to learn and to create new ideas and concepts, means that they need the teacher to assist them in making breakthroughs and establishing
new ideas. Argumentation discourse in the Science classroom has its roots in Vygotsky’s theory of learning (Duschl and Osborne 2002, p. 297). This is of particular importance in the Transition Year Science classroom, which offers far more scope and freedom for this type of discourse to take place (Scott 1998).

The above Figure (Figure 3.5) shows how the teaching and learning narrative in a science classroom can take place. Vygotsky’s work has been widely recognised for its influence in studies such as the CASE project. Within this project Vygotsky’s notion of the construction of knowledge through the Zone of Proximal Development is identified as one of the five pillars of CASE - construction (Adey 1999, p. 8, Bennett 2003, pp. 68-70).

3.5.3.3 Bruner

Like Piaget, Bruner identified general ‘modes of representation of knowledge’. He formulated three – the enactive mode, the iconic mode and the symbolic mode. The enactive mode of knowledge is knowledge about how to manipulate the environment through overt behaviour. This is the earliest stage at which a child understands the environment through action.

The second stage, the iconic mode, is the stage at which the child is able to process information by visual and auditory imagery. “With development, thinking becomes less stimulus bound and dependant on active manipulation of concrete objects.” (Good and Brophy 1990, p. 191)
The third and final stage is the symbolic mode. This mode of knowledge allows students to manipulate and interact with abstract concepts. This stage or mode allows students, to convert experiences into formulas and statements.

Bruner, unlike Piaget, did not believe that these three stages were age dependent. Rather, he believes that the child only takes in what they are ready to assimilate. The development of his theory was based on the following beliefs:

- Intellectual growth is characterized by *increasing independence of responses from stimuli*. Children are at first under rigid stimulus control: they respond in set ways to various stimuli. Over time they become increasingly independent of stimuli in the responses they make and the form those responses take, especially as they acquire a language system.

- Growth depends on the *development of an internal information-processing and storage system* that can describe reality. Unless children learn a symbol system, such as language, with which to represent the world, they can never predict, extrapolate, or hypothesize novel outcomes.

- Intellectual development involves *an increasing capacity to say to ourselves and others, in words or with symbols, what we have done and what we will do*. This point really deals with self-consciousness. Without the development of abilities to describe past and future actions, we cannot direct analytical behaviour toward ourselves or the environment.

- *Systematic interactions between a tutor and a learner are necessary for cognitive development.* Bruner’s point is that father, mother, teacher or some other member of society must teach a child. Simply being born into a culture is not enough for full intellectual development.

- *Language is the key to cognitive development.* It is through language that others communicate with us, teaching us their conceptions of the world. It is also through language that we communicate our conceptions of the world to others and question the way the world functions. Most important is the fact that as we grow older we learn to use language to mediate, interpret and reconcile events in our world. This ability to provide linguistic mediation ties one event to another in a casual way, links the new to the familiar, and allows us to code events so that we can deal with these internal representations.
Cognitive growth is marked by the increasing ability to deal with several alternatives simultaneously, to perform concurrent activities, and to pay attention sequentially to various situations (Gage and Berliner 1998, p. 109).

Piaget thought the symbolic stage to be the one where formal operational thought happened. However, Bruner believes that while the symbolic mode becomes the most dominant mode eventually, adults can still code their experiences in enactive and iconic modes.

Bruner was famous for his statement that “any subject can be taught in some intellectually honest way to any learner” (Good and Brophy 1990, p. 192).

3.5.3.4 Constructivism

Constructivism offers a view as to how learners explain and process the phenomenon they encounter. This approach is summarised in Figure 3.6.
This means that:

“instruction is designed and sequenced to encourage learners to use their experiences to actively construct understanding that makes sense to them, rather than acquiring understanding by having it presented in an organised format.”

(Borich and Tombari 1995, p. 206)

Thus we find that “knowledge is constructed in the mind of the learner” (Bodner cited in Shiland 1999, p. 107).
This theory of learning recognises that:

1. **Learning requires mental activity.** The process of knowledge construction requires mental effort or activity; material cannot simply be presented to the learner and learned in a meaningful way.

2. **Naïve theories affect learning.** New knowledge must be related to knowledge that the learner already knows. The learner has preconceptions and misconceptions, which may interfere with the ability to learn new material. These personal theories also affect what the learner observes. Personal theories must be made explicit to facilitate comparisons.

3. **Learning occurs from dissatisfaction with present knowledge.** For meaningful learning to occur, experiences must be provided that create dissatisfaction with one’s present conceptions. If ones present conceptions make accurate predictions about an experience, restructuring (meaningful learning) will not occur.

4. **Learning has a social component.** Knowledge construction is primarily a social process in which meaning is constructed in the context of dialogue with others. Cognitive growth results from social interaction. Learning is aided by conversation that seeks and clarifies the ideas of the learners.

5. **Learning needs application.** Applications must be provided which demonstrate the utility of the new conception

   (Shiland 1999)

Ultimately the constructivist view involves “creating a personal interpretation of external ideas and experiences” (Snowman and Biehler 2003, p. 301). Essentially pupils learn best when challenged and stimulated. They must become partners in their own learning and feel a sense of personal responsibility in the learning. Teachers must encourage open minded, reflective, critical and active learning, particularly in Science. The constructivist view of learning in Science takes into account the transmission of knowledge, discovery learning, active learning and developmental views of learning. Large scale studies which have taken place in the area of constructivism are the Children’s Learning in Science Project (CLISP) in the UK and the Learning in Science Project in New Zealand. Both these projects took place in the mid-nineteen eighties. These studies provided much evidence that
children “arrive in science lessons with ideas which they have formed in making sense of the world around them” (Bennett 2003, p. 35).

Many of these ideas differ from the accepted scientific ideas, partly due to many scientific observations being counter-intuitive. Also the pupils’ ideas appear to be resistant to change. In terms of Science teaching and learning, common practice has been to elicit the pupils’ beliefs and understandings about a topic in order to aid pupils to reformulate their ideas about scientific concepts. This can be done through presenting the pupils with some form of new stimulus or idea which challenges their original thinking and allows them to change their ideas.

3.5.3.5 The Information Processing Model: The effect of prior knowledge

All of the theoretical models discussed take into account the importance of pupils’ prior knowledge and experiences in their future learning. Ausubel et al. (1978) in emphasising the role of the prior knowledge pupils bring with them to the classroom noted that “if I had to reduce all of educational psychology to just one principle, I would say this: the most important single factor influencing learning is what the learner already knows. Ascertain this and teach accordingly.”

The theories of Piaget and Ausubel have laid the foundations of Johnstone’s Information Processing Model, which is illustrated in Figure 3.7 below. The constructivist approach of teaching and learning also has significant implications for how pupils process information.
In this model Information passes through the perception filter, and enters the conscious part of the mind, the ‘Working Memory Space’. In the ‘Working Memory Space’ there are two functions:

i. to temporarily store information and,
ii. to operate on the information to make ‘sense’ of it, to prepare it for a response and/or to store it in the ‘Long-term memory’

In order to make sense of the information in the Working Memory Space, information stored in the Long-term Memory must be called upon. However, if the learner has no prior connections to the material in the Working Memory Space they cannot make ‘sense’ of the new material, leading to rote learning of unconnected material which is difficult to recall (Johnstone 2006, Reid 2008, Johnstone 2010).

There is a relationship between Johnstone’s model of Information Processing and the theories of Piaget, Ausubel and the constructivist approach, all of which draw on prior knowledge in order to make sense of new information. This has significant implications for the learning of Science, as the abstract nature of the subject, and teachers working through all three domains of the triangle simultaneously may lead to a working memory overload, thus causing pupils to become ‘stuck’. In addition, if pupils do not initially store the correct knowledge in their working memory it may

Once misconceptions are created they are highly resistant to change (Peterson and Treagust 1989, Mulford and Robinson 2002) and require direct targeting in order to be changed or reduced (Thomaz et al. 1995, Wood and Breyfogle 2006, Hayes and Childs 2010, Regan et al. 2011).

### 3.5.4 Teaching and Learning methodologies for Science

Various teaching and learning methodologies have developed on the basis of these educational theorists and research models of teaching and learning (Bennett 2003). Pupils particularly value classes where their opinions are sought and valued (Jeffers 2011, p. 67). The Transition Year offers pupils the time and opportunity for this, and Jeffers (2007b;2008;2011) particularly noted how Transition Year pupils contrast their Transition Year and Junior Certificate experiences, with class time in Junior Certificate being ‘pressurised’ and ‘examination-driven’, while the Transition Year activities which involved learning beyond the conventional classroom was highly valued by pupils. Some of these methodologies which are particularly pertinent to the teaching and learning of Science are discussed below.

#### 3.5.4.1 Active learning

Active learning can “sometimes offer a much more powerful experience or insight into what is to be learnt than expository teaching” (Kyriacou 1998, p. 39). Kyriacou (1998) also stated that active learning consists of any learning activities where pupils are given a marked degree of autonomy and control over the organisation, conduct and direction of the activity. Active learning encompasses a whole range of learning theories such as: discovery learning, context-based learning, problem-based learning,
and constructivism (Gage and Berliner 1998). This type of learning requires the pupil to be active, either physically or cognitively. It is far removed from the traditional didactic model, and requires the pupils to think and to actively process new information.

Scientific conceptual understanding can take on a whole new meaning when dealt with in an active hands-on manner, as “the laboratory gives a dimension to scientific concepts that cannot be achieved simply by talking about them” (Monk and Osbourne 2000, p. 60).

3.5.4.2 Discovery Learning

Discovery learning was advocated by H.E. Armstrong in the late nineteenth century. Armstrong used the word discovery to mean a “fact uncovered by someone for himself, although well known to a large number of other people. There would be nothing new about the fact except the discoverer.” (Van Praagh 1973, p. 5) An integral part of the heuristic approach to the school Science experience is that pupils are trained how to find out things for themselves, through completing their own science experiments (Bennett 2003, p. 75).

Bruner recommended that schools and educators use discovery learning in their classrooms. “Discovery Learning is a method of inquiry-based instruction, discovery learning believes that it is best for learners to discover facts and relationships for themselves.” (Learning Theories 2008)

It is not a ‘discovery’ of new facts or material, but involves the learners’ educational experience being well planned and so they can use their previous knowledge to ‘discover’ a new fact or correlation through manipulation of objects and truths already learnt. The discovery while perhaps not being new to mankind is in fact new to the learner and creates a more meaningful learning experience. Teaching students using discovery learning techniques actively motivates the students to seek knowledge in order to satisfy their own curiosity. However, teachers cannot just allow discoveries to happen randomly and a well planned lesson and well prepared mind will allow discoveries to occur in conditions that are suitable, i.e. where teachers have already taught the background knowledge needed for the discovery to be made. This is known as guided discovery learning.
In the 1960s there was concern over Science achievements in the UK and participation rates. A response to this was the development of the Nuffield Science courses. The courses were developed to challenge the “traditional ‘teacher-as-transmitter-of-knowledge’ model” (Bennett 2005, p. 23). The courses were also developed in a way in which to present Science to pupils as a way in which they could conduct their own inquiries into the nature of things. While no one theory of teaching or learning was used as a basis for the Nuffield Science courses, Bruner’s and Armstrong’s theories on discovery learning are very much taken into account within these courses.

Practical work is organised in such a way that pupils must make their own observations, look for patterns and devise possible explanations for these patterns.

“Discovery learning takes a lot longer than simply telling someone that, say, plants will not grow in the dark. But once learned through discovery such facts are rarely forgotten.”

(Gage and Berliner 1998, p. 275)

3.5.4.3 Inquiry-Based Learning (IBL)

There is a considerable focus both internationally (Abd-El-Khalick et al. 2004), and nationally (Broggy 2010) on inquiry-based learning as a form of instruction. Current cross-country European Science education research projects (ESTABLISH and PROFILES) have taken a fully inquiry-based approach to the development of teaching and learning materials and training programmes. The inquiry-based approach is a core component of the current Junior Certificate Science syllabus. The inquiry-based learning approach is considered to “best reflect a quality science education and is strongly promoted” (Kahveci 2009, p. 109). It can be viewed as a vehicle through which to advance Science education, developing both in-depth understandings of scientific knowledge and rigorous application of scientific thinking processes (Lee and Butler Songer 2003). The inquiry-based teaching approach requires guidance for the pupil and has its roots in constructivism and Vygotskyian theory. It is based on the scaffolding approach of Vygotsky, with the zone of proximal development being significant in this approach (Lee and Butler Songer 2003, p. 925). Pedagogically, the teacher’s role within an Inquiry-based learning
class is characterized as that of a facilitator. The primary role is to encourage more appropriate pupil-pupil interactions, which conclude in a consensus, with the learners building new knowledge upon existing knowledge. Figures 3.8 and 3.9 illustrate the potential benefits of this approach for both the pupils and the teacher.

**Figure 3.8: Benefits of IBL for pupils (Broggy 2010)**

- Develops transferable skills that will be used later in their education
- Promotes student involvement in a fun way
- Increases student interactions and dialogue in the classroom
- Improves attitude towards science and the subject
- Increases confidence in science and classroom activities
- Gives the opportunity to find answers to their questions
- Develops the teachers teaching experience
- Makes science more enjoyable to teach
- Discovery of the students’ prior knowledge contributes to the planning
- Improves retention of knowledge

**Figure 3.9: Benefits of IBL for teachers (Broggy 2010)**

- Facilitator of learning rather than a ‘transmitter’ of knowledge
- Improves attitude towards science and the subject
- Increases student interactions and dialogue in the classroom
- Promotes student participation in the class
- Makes science more enjoyable to teach
- Develops the teachers teaching experience
As illustrated in Figure 3.10, the IBL process typically begins with a trigger question or problem, which leads to the pupil defining the problem.

Several key characteristics that promotes students’ learning of a subject

- Usually starts with a question or scenario
- Is student-centred
- Encourages students to ask questions
- Promotes student dialogue in the class and hence can provide opportunities to improve scientific language
- Emphasises data collection
- Promotes critical thinking
- Develops transferable life skills
- Encourages collaborative learning
- Is guided by the teacher who acts as a facilitator

(Broggy 2010)
As with all inductive methods, the information needed to address the challenge would not have been previously covered explicitly in lectures or readings, although it would normally build on previously known material. Inquiry has frequently been found to be more effective than traditional science instruction at improving academic achievement and the development of thinking, problem-solving, and laboratory skills.

3.5.4.4 Problem-based learning (PBL)

Problem-based learning can challenge learners to move towards a deeper understanding of knowledge, putting emphasis on the learners’ ability to investigate, question, and reflect (Kelly 2000), using existing knowledge to solve problems and identify new knowledge.

“At a fundamental level, problem-based learning is a conception of knowledge, understanding, and education profoundly different from the more usual conception underlying subject based learning.”

(Margetson cited in Boud and Feletti 1997, pp. 36-44)

Pupils are typically confronted with a poorly-structured open-ended, real-world problem to solve, and the pupils can often take the lead in defining the problem. This leads into a process of formulating and evaluating alternative solutions, selecting the best one, and making a case for it. Dochy et al. (2003) have argued that pupils experience more long-term retention of the knowledge they gained through problem-based learning, than through conventional teaching and learning techniques. Problem-based learning encourages open minded, reflective, critical and active learning which in turn creates a more stimulating lesson for the pupil, in line with Armstrong’s heuristic method (Bennett 2003). However, problem-based learning is arguably one of the most difficult to implement of all the inductive teaching methods. Criticisms of the approach are that it can be time consuming to construct authentic open-ended problems for the pupils, particularly when developing problems which require the full range of skills set out in the objectives of the curriculum. Benefits are that the pupil is given the responsibility of defining the knowledge and skills they need to progress with the problem themselves, however,
this may lead into uncharted waters and the teacher must be prepared and fully confident in their own Subject Matter Knowledge.

### 3.5.4.5 Context-based learning (CBL)

Yam (2008) describes context-based learning as:

> “a conception of teaching and learning that helps teachers relate subject matter content to real world situations and motivates students to make connections between knowledge and its applications to their lives as family members, citizens, students, and workers”

Context-based learning places pupils’ everyday and life experiences as an integral part of the lesson. This is particularly important in the science classroom as “contextualisation improves access to knowledge” (Peacock cited in Campbell and Lubben 2000, p. 239). The most frequent argument for context based learning is that it provides relevance by linking to the pupils’ everyday life.

> “Science courses relevant to employment may encourage the development of skills, attitudes and routines relevant to the workplace. Science courses relevant to society may emphasize socially and politically contentious content and encourage reasoning and decision-making skills appropriate for active citizenship.”

(Campbell and Lubben 2000, p. 240)

The reported benefits of this approach are the affective responses of the pupils to real-life situations, the gains in pupils’ understanding, attitudes, and abilities (in some cases). The development of critical thinking skills for pupils can be developed in a context-based classroom (Bailin 2002). Bailin argues that the premise of critical thinking is contextual, where learners are able to transfer knowledge from one context to another. As both the ROSE (Matthews 2007) and the PISA (Bybee and McCrae 2011) studies noted that pupils are interested in Science topics that are relevant to them, and the ‘human context’ of Science. Another benefit of the CBL approach is the positive effect that it has on the gender balance in Science (Bennett et al. 2007). However, there are distinct gender differences in terms of the contexts
through which male and female pupils are interested in learning (Matthews 2007, Bybee and McCrae 2011).

Context-based learning has been implemented in school Science education since the early nineteen-eighties. One of the most well known examples of the context-based approach is the Salters courses in the UK. The Salters’ Chemistry courses, and indeed other Salters Science courses were born from the concept of context-based learning and a ‘widely held concern’ held by teachers and other Science education practitioners and researchers regarding current practice and its effect on uptake of Science subjects (Lubben and Bennett 2006).

The team of teachers who met to design the Salters’ courses believed that Science needed to be made more accessible and appealing to pupils, their interests and their everyday lives.

The context-based approach has also been influential in the design of courses such as ‘Chemistry in Context’ in the United States and ‘Chemie im Kontext’ in Germany (Parchmann et al. 2006, Schwartz 2006). Both studies were developed due to unsatisfying results in international comparative studies such as TIMSS and PISA.

The ‘Chemie im Kontext’ study defines the meaning of context based learning as:

- **Context as content.** The design of teaching units must connect relevant contexts, from which questions are derived, and the basic concepts that can be applied to answer such questions. Other competencies, such as the research and presentation of necessary results or experimental investigations to develop such results, are included by the design of the teacher’s and the students’ activities.

- **Context as learning stimulation.** Learning environments must stimulate students’ personal mental activities to enable successful learning processes.

- **Context as frame for situated development and application of knowledge and competencies.** Learning processes in class must enhance and support the (social) development of competencies, especially the transfer of learning outcomes from one unit to another.

(Parchmann et al. 2006)

A context-based classroom can promote and enhance active pupil learning and integration of knowledge. Some of the issues that are claimed to be addressed by the
context-based approach are: curriculum overload and fragmentation, the presentation of a curriculum as a body of isolated facts and concepts to be learned; the inability of pupils to transfer any scientific knowledge or skills beyond the Science classroom (the context in which it was learned); curriculum content being irrelevant to pupils everyday lives, and a general confusion about why pupils should learn Science, given its lack of relevance to their lives (Millar and Osborne 1998, Gilbert et al. 2010).

3.5.5 Assessment

The term ‘assessment’ “may be used in education to refer to any procedure or activity that is designed to obtain information about the knowledge, attitudes, or skills of a learner or group of learners” (Kellaghan 2004, p. 2). Criticisms of assessment include its inaccuracies, unreliability and potential for distorting both teaching and learning and the curriculum.

Assessment is typically discussed in terms of norm-referenced assessment, criterion referenced assessment, and formative and summative assessment. Norm-referenced assessment compares pupils with each other, and rewards the best with the highest grades. Criterion-referenced assessment refers to a pupil meeting a set of criteria in order to pass an examination. Formative assessment involves assessing pupils throughout their learning, in order to diagnose issues and to improve teaching and learning. Summative assessment is a terminal assessment at the end of a learning block, typically in the form of an examination (Petty 2009, pp. 479-496). Table 3.1 below highlights the chief differences between and characteristics of summative and formative assessment.
<table>
<thead>
<tr>
<th>Summative assessment</th>
<th>Formative assessment</th>
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<tbody>
<tr>
<td>Takes place at the end of a learning or teaching block;</td>
<td>Takes place during teaching and learning;</td>
</tr>
<tr>
<td>Aims to measure and report on the learning outcomes in order to make comparisons;</td>
<td>Aims to establish pupils progress and diagnose their learning needs in order to support and enhance the learning experience;</td>
</tr>
<tr>
<td>Uses formal methods;</td>
<td>Uses both formal and informal strategies;</td>
</tr>
<tr>
<td>Well established and traditional form of assessment;</td>
<td>Recent development in assessment;</td>
</tr>
<tr>
<td>Associated with accountability.</td>
<td>Associated with pupils’ educational development.</td>
</tr>
</tbody>
</table>

Formative assessment is generally favoured by educators, as it offers more benefits to pupils. Black and Wiliam (1998) describe formative assessment as best practice, as it finds faults, attempts to fix them, and follows them up. Whereas, summative assessment or conventional practice tends to teach, test, grade and move on. Their study found that effective formative assessment has great benefits for the learner, adding the equivalent of two grades to the pupils’ results. The greatest effects of formative assessment are for the weakest learners, but teachers generally do not use formative assessment strategies. Both formative and summative assessment has the potential to make considerable use of Blooms taxonomy for the cognitive domain, illustrated in Figure 3.11.
Research in Ireland has indicated that current summative assessment is not meeting the upper levels of the cognitive domain, and are thus primarily testing recall (McCrudden 2008).

Atkin and Black (2003, p. 100) have noted that typically there are two primary goals of assessment; to “make concrete what the curriculum actually is intended to accomplish” and to provide a “currency for public accountability”. This appears to be true of all settings and contexts: within the Irish context Hanafin and Leonard (1996, p. 26) note that systems of assessment are ‘inextricably linked’ with both public and governmental perceptions of ‘quality and attainment’. Unfortunately both of these objectives invariably lead to ‘teaching to the test’. A single summative examination involves high stakes for pupils and teachers alike, and “Whilst teachers clearly have to conform to the external summative assessment which is in place, care should be taken to ensure as far as possible that pupils’ learning is not adversely affected by assessment driven teaching, with good practice being curtailed in order to prepare for summative assessment” (Bennett 2003, p. 241). Assessment essentially becomes a measure of a school’s effectiveness, and the sole indicator utilised to measure this construct, as a measure of pupils’ attainment in some summative examination is far easier to measure “than the elusive nature of the other features” of effective schooling (Hanafin and Leonard 1996, p. 29). This has led to the development of a
culture of assessment, rather than education in Ireland. These practices are true for all subjects, but in the context of Science it is particularly worrying.

“Science educators agree that good assessment practices are integral to informing teaching and learning, as well as measuring and documenting student achievement. In the current climate of highstakes testing and accountability, the balance of time, resources and emphasis on students’ scores related to assessment have been tilted towards the summative side. Unfortunately, this had led to a cycle of even more standardized testing of students and the “mile wide, inch deep” instruction, often with only marginal gains of achievement.”

(Keeley 2008, p. 2)

The implications of poor assessment techniques in the teaching of Sciences are related to the nature of the subject, and the difficulties that pupils have with understanding its often complex and abstract nature. If assessment is primarily summative and used to ascertain standards pupils may never fully understand the subject, and difficulties and misconceptions in the subject may persist into later life. Teaching to the test in order for pupils to achieve the best possible scores has implications for their learning and understanding beyond the lower levels of Bloom’s cognitive domain. This is a serious concern within the Irish education system, particularly at second level, as there is a strong culture of ‘teaching to the test’ (Smyth et al. 2007, Jeffers 2011). The Transition Year is highly unusual in that the guidelines (Department of Education 1993c, p. 9) suggest that assessment be diagnostic and formative. The guidelines also state that the assessment modes chosen by schools should be appropriate and complementary to the variety of approaches featured in the programme. Pupils who have passed through the Transition Year Programme into senior cycle, have reflected positively on these assessment methods and the year in general, but have also been aware of the tensions between the two programmes. The broad, all-encompassing educational experience that the Transition Year strives to offer is diametrically opposed to the demands and rigours of the Leaving Certificate system, in both its teaching and assessment (Jeffers 2011, p. 67).
3.5.6 Teaching Science

Unfortunately, “traditionally science teaching in Ireland has been largely didactic with teachers and students performing clearly defined experiments as prescribed” (Forfás 1999, p. 20).

Teachers are the gatekeepers for the future generations of scientists and engineers, two key players in the knowledge economy (Childs 2009, Flynn 2010). Good teachers know their subject thoroughly, and display passion for their subject (Childs 2009). The issue lies, not in a lack of knowledge about how pupils learn, or in a lack of research about how to teach. The issue is how to link research and practice, in order to apply evidence-based best practice to the Science classroom (Childs 2009). The Perkins (2007) model of teaching and learning (Figure 3.12) is useful, and advocates teaching ‘smarter’, not ‘harder’. Formative assessment has a key role to play in teaching smarter and helping pupils develop a deeper understanding and knowledge of Science.
Childs (2009, p. 194) further develops his point to note that nearly all second level teachers are exposed to educational theory and subject specific pedagogical training, but that this is often not carried out “in the context of what they are going to teach.” As Hargreaves (2003, p. 16) notes, teachers “can no longer take refuge in the basic premises of the pre-professional age.” Once a teacher, the learning process is not over, it is not “managingly hard, but technically simple”, teaching is a profession and as such members of this profession should keep up to date with current best-practice.

Ausubel, Novak and Hanesian (1978, p. 499) have argued that the way a teacher teaches must be appropriate for their pupils. These

“teaching styles (including group-centred versus teacher-centred approaches, lecture versus discussion) should be adapted to the particular strengths and weaknesses of a given teacher’s personality, background and perception. They should also vary in relation to individual differences in pupils’ personalities, cognitive style, and intellectual abilities, as well as to the nature of the learning material and the particular educational objectives involved in a given learning situation.”

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**Figure 3.12: Three responses to trouble spots in learning**
The viewpoint of Ausubel *et al.* (1978) requires much of the teacher, and this has been further developed under the framework of Shulman’s (1987) proposal on Science teacher education. A model of a Science teachers’ knowledge base is illustrated in Figure 3.13 below.

![Figure 3.13: A model of Science teacher knowledge (adapted from (Abell 2007, p. 1107).](image)

Magunsson, Krajcik and Borko (1999) maintain that SMK and PCK are separate entities, as Shulman himself did. This is described by Gess-Newsome (1999) as the ‘transformative model’. The teacher has a highly developed professional knowledge base, comprising of subject matter knowledge (SMK), pedagogical knowledge (PK), and knowledge of context (KoC), and this knowledge base is contained within a teacher’s pedagogical content knowledge (PCK) base, which in turn can be limited by how well developed each knowledge base is. While subject matter knowledge is one component of a teacher’s professional knowledge base, it must be adapted for pupils by teachers’ pedagogical content knowledge (PCK). SMK is a central element of a Science teacher’s professional knowledge base. The transformative nature of teaching, converting the teacher’s own SMK into school Science, while accounting for pupil background, ability and the substantive and syntactic nature of the subject, is no easy task (Hashweh 1987, Abell 2007, Kahveci 2009). Without a solid SMK teachers may perpetuate their own misconceptions, or fail to recognise misconceptions among their pupils, thus preserving the perception that Science is a
difficult and complicated subject. Many (pupils, students, teachers and the public) believe that Science is difficult, complex and boring. (Chiu 2005, Johnstone 2010, Sheehan 2010) School-based science is driven by examinations (the points race!) and the demands of the curriculum. Teachers can often become caught up in this and neglect to ‘think outside the box’, by failing to apply their SMK and PCK to their classroom practice. Issues also stem from a deficiency in PCK, which is domain-dependent. It is an integral part of a teachers job to ‘re-package’ their knowledge, and to represent it in a form that allows their pupils to understand and assimilate it (Bucat 2004). Teachers play a crucial role in the learning of Science and they can influence pupils’ opinions and attitudes. Teachers must have an appropriate teaching style, adapted for their pupils’ particular needs, and not just an empty emphasis on practical work (Glynn et al. 1991, p. 3). Mooney Simmie (Mooney Simmie 2007) noted that:

“Science needs to be taught in stimulating, imaginative and creative ways that develop students’ curiosity and entice them further to explore the wonders of the physical and the living world.”

The teacher must be a motivator, diagnostician, guide, innovator, experimenter, and researcher (Osborne and Freyberg 1985, pp. 91-99). Teachers’ practices in teaching Science have much to do with their own beliefs and PCK; teaching Science is a challenging role, which can exert huge influence on the pupils.
3.6 Summary

Ireland has a highly centralised and standardised school system, which is particularly dominated by ‘high-stakes’ examinations at both lower and upper second level education (Smyth et al. 2007, Jeffers 2011). This rigidity and pressures attached to this system can make change and teaching ‘outside the box’ particularly difficult. This chapter has discussed some of the primary research areas within the domain of Science education, and allowed an insight into best practice. The Transition Year is a unique opportunity for teachers and schools to implement best practice into their teaching and learning methodologies, and to make changes in their practices, thus promoting learning and attitudes towards Science. The year places a particular emphasis on teachers employing a wide range of innovative teaching and learning methodologies, and requires a whole school, whole community approach which is very much aligned with the many of the recommended approaches in Science teaching and Learning.
CHAPTER 4: METHODOLOGY
4.1 Introduction

Research is

“a process of systematic inquiry that is designed to collect, analyse, interpret, and use data to understand, describe, predict, or control an educational or psychological phenomenon or to empower individuals in such contexts.”

(Mertens 1998, p.2)

Bodner (2007, p. 4) suggests that a good Ph.D. dissertation proposal contains three fundamental components:

- A theoretical framework upon which the study will be built;
- Guiding research questions to be answered by the study, which are consistent with the theoretical framework;
- A methodology that is appropriate to answer the guiding research questions.

This research undertaken for this project is diverse by its very nature, with many different facets of the implementation of Science in the Transition Year being examined. The author is investigating the place of Science in the Irish Transition Year, its role within the year and the effect that taking the subject has on the uptake of Science at Senior Cycle and third level. The diversity of this study demands a research design which will allow for an accurate representation of the situation. This chapter will provide the rationale for the research design.
4.2 Research Aims and Questions

The work presented in this study stemmed from an overarching research aim, ‘to examine and evaluate the place of Science in the Irish Transition Year’. It was from this central aim that three main research questions were developed, with nine subsidiary questions. These research questions were an encompassing theme throughout each phase of the research.

The three primary research questions were:

- What are the pupils’ experiences of Transition Year Science?
- What is the role of Science within Transition Year schools?
- How do science teachers utilise the Transition Year to teach Science?

In order to fully answer these research questions and focus the study, nine subsidiary questions were formulated. These subsidiary questions are:

- What are pupils’ attitudes towards Transition Year Science?
- What are pupils’ experiences of making subject choice decisions for senior cycle? Where do they get their information from and what type of information/advice do they receive?
- How do Transition Year pupils’ experiences of Science differ from Junior Certificate pupils’ experience of the subject?
- Why do pupils who choose to take Science at senior cycle choose to do so? What impact, if any does taking Transition Year Science have on these decisions?
- Are there any factors that impact on how Science teachers teach Transition Year Science?
- What do Transition Year Science teachers teach in their Transition Year Science classes? What is their rationale for teaching the content that they teach and how is it taught?
- Do schools display differences in how they provide Science both in the Transition Year and subsequently at senior cycle?
- How is Transition Year Science treated and perceived within schools?
Figure 4.1 indicates the relationship of each of the sub questions to the three research questions. These questions guided the research and provided the basis for exploring the overall aim. Table 4.1 also illustrates how this study progressed.
Figure 4.1: Relationship of the overall research aim to the research question.
### Table 4.1: Timeline of the research

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<td><strong>Year 1 2007/2008</strong></td>
<td><strong>Desk research</strong></td>
<td>Literature review of the role of the Transition Year in the Irish education system, treatment of Science education in Ireland, student attitudes towards Science. (Chapters 2 &amp; 3)</td>
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<td><strong>Year 3 2009/2010</strong></td>
<td><strong>Desk research</strong></td>
<td>Entry of 3rd level student questionnaire data into SPSS. Analysis of collected data.</td>
<td>Qualitative data collection from teachers</td>
<td>Quantitative data collection from 3rd level students</td>
<td>Quantitative data collection from 2nd level pupils and teachers</td>
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**Notes:**
- **Desk research:** Literature review, data collection, analysis, and writing.
- **Field research:** Data collection, analysis, and writing.
- **Writing Tasks:** Literature review, methodology, results and discussion chapters, and conclusion.
4.3 Theoretical Framework

This section of the methodology chapter examines the theoretical considerations which underpin this research study. The author discusses her methodological stance which informs the research design. This study has been influenced by many different factors. The author believed that the theoretical framework should be “viewed as a conceptual template with which to compare and contrast results, not seen as establishing a priori categories for data collection and analysis.” (Mertens 1998, p. 51)

This study originated in a Final Year Project which examined the place of Science in the Transition Year (Lally 2007). Though the scope of this project was limited, it highlighted the need for a larger scale study. This led on to a thorough review the literature, which informed the theoretical stance of this study. There have been many comprehensive studies of the Transition Year in Ireland (Millar and Kelly 1999, Jeffers 2002, Smyth et al. 2004, Jeffers 2007b;2008;2011). These studies have been extremely informative and comprehensive in their examination of the Transition Year, highlighting the considerable differences in how the programme is run in each school, as well as the importance of the year. There have also been many efforts made by educators, academics and industry to promote Science in the Transition Year, seeing the Year as a vehicle through which to advocate on behalf of Science (Irish Peatland Conservation Council 2004, Jones 2004, AG Educational Services 2005;2006;2007;2008, Brabazon 2008b, National Council for Curriculum and Assessment 2008a, AG Educational Services 2009;2010, Childs 2010c, Childs et al. 2010). There have also been interventions in the area of Transition Year Science, in an effort to promote the subject and examine the teaching and learning methodologies and the subject content. (Smith 1998, Smith and Matthews 2000, Regan 2005, Childs et al. 2010, Matthews 2010). However, while research in the area of Transition Year Science has widened and become slightly more extensive, there has been an element of ‘putting the cart before the horse’ and no study has been completed to ascertain the place of Science in the Transition Year. This omission gave rise to a number of research questions which this study sought to clarify.

Mertens (1998, p. 51) notes that a theoretical framework should not be static, but dynamic, evolving with the study. Having completed an ongoing literature review for
this study the author decided that a ‘fit for purpose’ approach to the study would offer the most useful outcome. Therefore the author decided to adopt a dual theoretical framework, utilising a synthesis of both the positivist (normative) and interpretive approach. Bodner (2007, p. 13) notes that we do not need to accept all assumptions of a given theoretical framework as it is applied to a study. However, the researcher does need to be explicit about which assumptions are applicable to their study. The author believed that, given the nature of the study, the use of the two research paradigms offered a more holistic approach.

The positivistic approach is grounded in the scientific method (Borg and Gall 1983, p. 26) (See Figure 4.2). It is the search for the truth, insofar as we can get it (Bodner 2007).

Figure 4.2: Scientific method

Positivism involves a definite view of social scientists as analysts or interpreters of their subject matter (Mertens 1998, pp. 10-11, Cohen et al. 2007, p. 10). The epistemology of the approach deems the researcher’s objectivity as important, as the researcher should observe and analyse in a dispassionate manner (Mertens 1998, p. 8).

This objectivity is the standard that the positivist researcher strives for.
The positivistic approach has been one of the dominant research paradigms throughout history, however, as researchers made the shift from pure Science research into the social sciences and education, it was realised that humans cannot be treated as objects (Borg and Gall 1983, p. 27). The positivistic researcher aims for generalisability in their results, and this is one of the hallmarks of positivist research (Borg and Gall 1983, p. 27). However, this is an inherent failing in the approach when applied to the social sciences. Human nature offers too many variables, and in order to treat the participants involved in research as ‘objects’ to be studied and to draw conclusions from, one is inferring that human nature does not exist. The best that one can hope to do when using a positivistic approach is to apply rigorous, scientific methodological techniques to the research and hope to be able to make a strong case with the results. It is the nature of the study of humans that one can never fully prove a theory, but one can draw on the results to make a strong case.

The interpretive model is more concerned with the social construction of meaning (Mertens 1998, p. 11). Interpretivists believe that knowledge is subjective, personal and unique (Cohen and Manion 1994). The interpretive approach focuses on the action of human behaviour. The author recognises that in choosing to use an interpretivist approach through which to conduct the research she approaches the research with her own prior knowledge and assumptions. However, like all research paradigms there are failings. There are issues arising with the interpretivist approach as there are flaws in any approach, and the important point is that the researcher is aware of the pitfalls. Interpretivists often use increasingly complex research methods. Rather than moving into a zone of deeper understanding of the real world experience the interpretivist seeks to know, they can move further and further into the world of abstraction. Individuals being studied may develop a false consciousness and not behave/respond in a normal and natural manner. When a researcher goes too far into abandoning scientific procedures, there is a risk of not being able to generalise results, and the scope of the research may become too narrow (Cohen et al. 2007, p. 22). In contract positivists argue that what they do is ‘good Science’, free from individual bias or subjectivity (Denzin and Lincoln 2005, p. 12).

The use of both paradigms has been noted to extend “dissertation studies beyond normal limits of size and scope” (Creswell 1994, p. 7). However, the author believes that turning to a plural theoretical approach does not weaken the research, nor is it a rejection of one approach in favour of another, but, by blending the two “we can
achieve binocular vision” (Eisner 1981, cited in Borg and Gall 1983, p. 9). The multi-method approach is utilised to complement different aspects of the study, and to triangulate the research. The author recognises the scope of this study is broad, and while general results are sought, the multifaceted nature of education research requires a deeper understanding of the complexities of Science in the Transition Year.

“The combination of multiple methodological practices, empirical materials, perspectives, and observers in a single study is best understood, then as a strategy that adds rigor, breadth, complexity, richness, and depth to any inquiry.”

(Flick 2002, p. 229 cited in Denzin and Lincoln 2005, p. 5)

Both these theoretical paradigms can be viewed as either quantitative or qualitative. Traditionally these approaches fall under the separate models. Quantitative methods are usually considered positivist, while the qualitative approach is commonly placed under the interpretive model.

### 4.4 Research Design

There is no “single blueprint” for planning a research study; a study must be governed by the notion of ‘fitness for purpose’ (Cohen et al. 2007, p. 78). The research design of a study provides the overall structure to the study, bringing all the elements of the research together (Leedy and Ormrod 2005, p. 85). When designing the research, the researcher must take the aims and the research questions of the study into account; this focuses the study, calling for the collection of different types and interpretations of data. Following on from this, the practical elements of the study must be considered, such as, issues related to data availability, collection and interpretation, and timeframes (Leedy and Ormrod 2005, p. 87, Booth et al. 2008, p. 32). This is a crucial time in the study. Ensuring that a suitable and practical research design is developed, which is appropriate for the subject matter being examined, is vital to the outcome of the study.
Establishing a research design appropriate to the study involves a detailed look at the overall aim of the study and the research questions on the part of the researcher. The author identified that there was a lack of information about Science in the Transition Year. This issue has been the main focus of this study. In order to comprehend the situation, a variety of data from different sources would need to be gathered. The author identified that in order to obtain as complete a view of Science in the Transition Year as possible, a mixed method approach would best serve the requirements of the study. This approach will be discussed in more detail further in this chapter.
Figure 4.3: Breakdown of the phases of the research study.
4.5 Research Methodologies:

4.5.1 The quantitative versus qualitative research paradigm

For over a century researchers have struggled to convince the academic community of the validity of their views, in what have become known as the paradigm wars (the qualitative versus quantitative paradigm) (Johnson and Onwuegbuzie 2004, p. 14). With purists on both sides viewing their own paradigms as the ideal standard in research, deciding which stance to take has often been a difficult one. Some purists, such as Guba (1990, p. 81) have contended that “accommodation between the paradigms is impossible”, that the paradigms are incompatible (Smith 1983, Lincoln and Guba 1985). Therefore arguments for and opposing the two paradigms have resulted in two very different research cultures. The quantitative researcher is concerned with the hard data of a study, with facts and generalisability; whereas the qualitative researcher is interested in both the researchers and the study participants’ subject experiences, with deep and rich data and observations (Johnson and Onwuegbuzie 2004, p. 14). There are many paradigmatic differences between the two approaches. While there are similar elements between both the qualitative and quantitative approaches to research (e.g., formation of one or more hypotheses, review of the literature, collection and analysis of data), these processes are often combined and carried out in different ways, leading to distinctly different research methods (Leedy and Ormrod 2005, p. 94).

Both research methods can be defined on the basis of their ontology, the relationship of the researcher to what is being examined, and the process of the research itself. The qualitative paradigm is concerned with a deep understanding of the process being studied; whereas quantitative studies are more concerned with generalisability. These two approaches are compared in Table 4.2.
4.5.2 Qualitative research

Qualitative research is interested in the personal beliefs, values and views of the subjects sampled. Researchers using the qualitative method “are more concerned to understand individuals’ perceptions of the world. They seek insights rather than statistical perceptions of the world” (Bell 2005, p. 7). When interested in qualitative research, one is always mindful of the importance of the subjective experience of individuals (Cohen and Manion 1994, p. 8). Merriam (1998, pp. 19-20 cited in Creswell 1994, p. 145) has noted that there are six assumptions of qualitative research designs.

1. “Qualitative researchers are concerned primarily with process, rather than outcomes or products.
2. Qualitative researchers are interested in meaning – how people make sense of their lives experiences and their structures of the world.
3. The qualitative researcher is the primary instrument for data collection and analysis. Data are mediated through this human instrument, rather than through inventories, questionnaires, or machines.
4. Qualitative research involves fieldwork. The researcher physically goes to the people, setting, site or institution to observe or record behaviour in its natural setting.
5. Qualitative research is descriptive in that the research is interested in process, meaning and understanding gained through words or pictures.
6. The process of qualitative research is inductive in that the researcher builds abstractions, concepts, hypotheses, and theories from details.”

Generally the qualitative paradigm falls under the interpretivist approach, and as such the biases and values of the researcher should be stated explicitly (Creswell 1994, p. 147). The qualitative researcher must “purposefully select informants (or documents or visual material) that will best answer the research question. No attempt is made to randomly select informants” (Creswell 1994, p. 148). The main purposes of this approach is to answer questions about the complex nature of phenomena, to determine the categories, relationships and assumptions that inform the respondents’ view of the world and of the topic being explored. The intention of the qualitative researcher is to realise that experiences are subjective, and to understand the
phenomena from the participants’ point of view (Basit 2003, p. 143, Leedy and Ormrod 2005, p. 94).

4.5.3 Quantitative research

Quantitative research involves the collection of statistics in order to analyse, interpret and develop conclusions. All quantitative researchers “collect facts and study the relationship of one set of facts to another.” (Bell 2005, p. 7) Put plainly, quantitative research looks at the numbers involved in a situation. The concrete facts which can be gleaned from this type of research can prove very valuable: it requires “evidence that is observable and testable” (Balnaves and Caputi 2001, p. 29). This approach typically falls under the positivist paradigm, focusing on the measurable data. The quantitative researcher believes that there is a reality, out there to be measured. This is often known as a naïve view of reality. As it falls under the positivist paradigm, quantitative research is often carried out in experimental settings. This can lead to conditions that do not offer a true image of the reality being measured; this is often the nature of positivist research. However, the design of the study must take this into account. Because quantitative purists believe that reality can be measured issues of reliability and validity become important in the research design. This should lead to a careful design of the data collection methods, attempts to eliminate bias, and the selection of a representative sample from the population (Creswell 1994, p. 116). These issues will be discussed in greater detail further in the chapter.

4.5.4 The mixed method paradigm

The mixed method paradigm is formally defined as “the class of research where the researcher mixes or combines quantitative and qualitative research techniques, methods, approaches, concepts or language into a single study” (Johnson and Onwuegbuzie 2004, p. 17). This approach can be thought of as the third research paradigm (Collins et al. 2006). Johnson and Onwuegbuzie (2004) note that by moving beyond the paradigm war the mixed method approach can offer a logical and practical alternative, to the traditionally dogmatic approach of the purists. This approach offers the researcher choices, both in how the study is designed, but also in what methods to use for data collection, analysis and interpretation. It is an eclectic
approach, being derived from the similarities between the two approaches and the
desire to overcome the weaknesses of each approach on its own (Snape and Spencer
2003). Making the distinction between quantitative and qualitative research does not
imply that the approaches are mutually exclusive (Leedy and Ormrod 2005, p. 97).
Table 4.2 illustrates the distinguishing characteristics of both approaches.
Table 4.2: Distinguishing characteristics of quantitative and qualitative approaches (Leedy and Ormrod 2005, p. 96).

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<th>Question</th>
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| What is the purpose of the research? | • To explain and predict  
• To confirm and validate  
• To test theory | • To describe and explain  
• To explore and interpret  
• To build theory |
| What is the nature of the research process? | • Focused  
• Known Variables  
• Established guidelines  
• Predetermined methods  
• Somewhat context-free  
• Detached view | • Holistic  
• Unknown variables  
• Flexible guidelines  
• Emergent methods  
• Context-bound  
• Personal view |
| What are the data like, and how are they collected? | • Numeric data  
• Representative, large sample  
• Standardised instruments | • Textual and/or image-based data  
• Informative, small sample  
• Loosely structured or non-standardised observations and interviews |
| How are data analysed to determine their meaning? | • Statistical analysis  
• Stress on objectivity  
• Deductive reasoning | • Search for themes and categories  
• Acknowledgement that analysis is subjective and potentially biased  
• Inductive reasoning |
| How are the findings communicated? | • Numbers  
• Statistics, aggregated data  
• Formal voice, scientific style | • Words  
• Narratives, individual quotes  
• Personal voice, literary style |
Both approaches use empirical observation to address the research questions, describe data, construct arguments from the data, and further hypothesise on the outcomes of the study. It is important to focus on how these techniques can be integrated. In mixed method research the integration of both methods can better allow the researcher to understand the concept being explored (Creswell 1994, p. 177, Neill 2007). This approach offers “great promise for practicing researchers who would like to see methodologists describe and develop techniques that are closer to what researchers actually use in practice.” (Johnson and Onwuegbuzie 2004, p. 15). The goal of the mixed method paradigm is not to replace either approach, but to draw on the strengths of both, while minimizing the weaknesses.

Greene et al. (1989 cited in Creswell 1994) note that there are five purposes for combining methods in a single study:

- Triangulation in the classic sense of seeking convergence of results;
- Complementarily, in that over-lapping and different facets of a phenomenon may emerge (like peeling the layers of an onion);
- Mental development, wherein the first method is used sequentially to help inform the second method;
- Initiation, wherein contradictions and initial perspectives emerge;
- Expansion, wherein the mixed methods add scope and breadth to a study.

The typology of the mixed method paradigm can take several forms (Creswell 1994, Johnson and Onwuegbuzie 2004). Johnson and Onwuebugzie (2004) focus on two: the mixed model and the mixed method approach. The mixed model approach mixes both the qualitative and the quantitative approaches within or across the stages of the research process. The mixed-method technique involves the inclusion of a qualitative and a quantitative phase within the overall research study. This study has utilised the mixed-method design. When using this approach there are two primary decisions to be made; whether to operate within one dominant paradigm or within a paradigm which places both elements of the study as equals. One also must decide whether to conduct the phases either concurrently or sequentially. Whichever method the researcher decides upon, the findings must be integrated at some point throughout the research. One may inform the other, in a sequential manner, or if the study is carried out in a concurrent fashion, the researcher must integrate the findings during the
analysis and interpretation. This study has drawn on the dominant/less dominant
design (Creswell 1994). While both qualitative and quantitative approaches were
utilised within the study, there has been a slightly more dominance of the
quantitative approach, with the use of the qualitative approach to add a greater sense
of depth and scope to the overall emerging picture. This has been carried out in both
a sequential and a concurrent manner. This will be discussed in greater detail further
in the chapter.
Figure 4.4: Mixed research process model (Johnson and Onwuegbuzie 2004, p. 23)

Note. Circles represent steps (1-8) in the mixed research process; rectangles represent steps in the mixed data analysis process; diamonds represent components.
4.6 Phases of the research study

Figure 4.3 outlines the three phases of this study. Phase 1 was the initial phase, the results of which informed Phases 2 and 3. Phases 2 and 3 were carried out simultaneously. These phases will be outlined in further detail in the subsequent sections.

4.6.1 Phase 1 – Initial Teacher Survey

Phase 1 is the initial phase in this research project. This phase involved a thorough review of the literature, and the exploration of Transition Year Science teachers’ attitudes towards and views of Transition Year Science. In addition this phase also explored what these teachers were teaching in their Transition Year Science classes, and how they taught their material. This phase involved all second level schools in Ireland who offered the Transition Year in the school year 2006-2007.

4.6.1.1 Questionnaire design

Cohen and Manion (1994, p. 92) noted that “An ideal questionnaire possesses the same properties as a good law: It is clear, unambiguous and uniformly workable.” A well designed questionnaire should give you all the information you need and eliminate problems with analysis (Bell 1999;2005). The questionnaires involved in this survey were all planned and designed to fit the needs of the study. This was done by:

- Laying out the questionnaire in a clear coherent manner. This allowed for a logical development of questions within the questionnaire;
- Ensuring that questions were not split over pages;
- Including both open ended and closed questions;
- Ensuring that the questionnaire was typed with clear instructions in a bold font;
- Designing it so that there were no leading questions or questions that used negatives.

The main questionnaire was developed using some selected questions from Lally’s (2007) pilot study as a foundation, in order to provide a direct comparison between the two studies. The questionnaire was divided into three sections; section one had
questions on factual information on the teacher, their school and teaching methods in Transition Year; section two’s purpose was to gather information on attitudes to Transition Year, Transition Year Science and teaching methods in Transition Year Science; the third section’s purpose was to discover what resources are being used by teachers in the Transition Year Science classroom and their limitations.

A further two questionnaires about the University of Limerick’s ‘TY Science’ resources and PharmaChemical Ireland’s Transition Year resources, were similar in design for both ease of analysis and ease of response. These two questionnaires were to be answered only if teachers indicated that they had used them previously, in a filter question in the main questionnaire.

Both open and close ended questions were used in all three questionnaires in this study. The open ended questions sought to explore teachers’ opinions and thoughts on various issues regarding Transition Year and Transition Year Science. Open ended questions often provide the richest data, unbiased by the researcher’s own opinions.

The close ended questions were used to provide quantitative data. The following types of questions were used:

1. Dichotomous questions were used. These are close ended questions containing only two possible answers. For example Yes/No, True/False etc.

2. Filter or Contingency questions were also used. These involve using the answer from one question to determine whether the respondent is qualified to answer another subsequent question. This is used in order to ensure that respondents only answer relevant questions in the questionnaire.

3. Matrix questions assign identical response categories to multiple questions. Questions are placed one on top of each other, forming a grid with questions down one side and response categories on top of the page. This is done in order to make efficient use of page space and to make the questionnaire appear quicker.

4. Scaled questions are those using Likert scale and Semantic differential scale. They are interval scale questions, graded on a continuum.

Likert scales are usually five point questions where the respondent is asked to indicate their level of agreement with a statement. The Likert scale questions used in this study were based on a scale ranging from ‘strongly disagree’ to ‘strongly agree’.

“The first step in constructing a Likert-type scale consists of collecting a number of
Statements about a subject.” (Best 1981, p. 181). Statements were collected from a number of sources found through the literature (Regan 2005, Jeffers 2007b, Lally 2007) and from personal conversations with Transition Year Science teachers. These statements were adapted for use where necessary.

The advantages of using the Likert scales are:

- It can be carried out without a panel of judges and is based on empirical data rather than the opinion of judges;
- There is a greater ease of preparation;
- It produces more homogeneous scales and increases the probability of a unitary attitude being measured; as a result, validity and reliability are reasonably high.

4.6.1.2 Piloting the instrument

While the study used by Lally (2007) was viewed as a pilot for this study, a pilot of the new questionnaire needed to be completed before they could be sent out. The purpose of this pilot was to validate the questionnaire, highlight misleading questions and sources of ambiguity. This questionnaire is available in Appendix A.

The initial versions of all three questionnaires were piloted in ten randomly selected schools from the list of schools offering the Transition Year Programme (N = 524). These questionnaires were sent by post to the ‘Head of Transition Year Science’. Three were returned giving a response rate of 30% and phone calls were also used to follow up on responses, but this did not elicit any further responses.

“All data-gathering instruments should be piloted to test how long it takes recipients to complete them, to check that all questions and instructions are clear and to enable you to remove any items which do not yield usable data”

(Bell 1999, p. 128)

Once the pilot was completed, further adjustments were made to the questionnaires in order to make questions clearer and more user-friendly. Piloting increases validity and reliability through the revision of the various questions and statements in order to ensure suitability for the sample audience.
4.6.1.3 Letter to the sample schools

An information letter, along with the questionnaire was issued by the author to the schools (N = 514), this letter can be viewed in Appendix L. Including a covering letter is fundamental. The primary goal of such a letter is to convey the overall aim of the survey, its importance, assure confidentiality and to encourage replies (Cohen and Manion 1994, p. 97).

A return date was also included on the covering letter to encourage a good and prompt response rate. Information sheets and consent forms were also issued. The purpose of this was to inform the participants about the aims of the research and to gain permission to use their responses to the questionnaires. The letter, information sheets and consent forms are given in Appendix L.

4.6.1.4 The research sample

“The method of selecting a sample is critical to the whole research process” (Borg and Gall 1983, p. 239, Collins et al. 2006). When choosing schools to survey, several factors were considered. “The first step in sampling is to define the target population” (Borg and Gall 1983, p. 241). Transition Year is an optional programme: not all schools choose to offer it and not all pupils in those who do offer it are obliged to take it. With this in mind, it was important to get a complete picture of what schools were offering the year and how exactly Science was being treated in those schools. The decision was made to do a total survey of all schools, listed as offering the Transition Year in the school year 2006/07. All schools were chosen in order to provide an accurate range of the type of schools offering the programme. The number of schools surveyed, excluding the pilot (N=10), was 514. There were 88 (17.12%) respondents to this questionnaire.

4.6.1.5 Data Collection

Following the pilot study, questionnaires were issued to the 514 schools (excluding the 10) listed by the Department of Education and Science. 88 of these questionnaires were returned. Postal surveys are usually the best type for a large scale study such as this. The proposal of visiting schools individually, particularly for such a large number, was neither realistic nor practical.
However, a number of techniques are recommended in order to improve the response rate of those surveyed.

- The questionnaires were designed to obtain the exact information required and no more;
- Unclear terms and abbreviations were avoided;
- Leading questions were avoided;
- Directions for answering questions were included;
- The easiest questions were the first ones the respondent answers.

All of these techniques were employed to ensure a good response rate from those surveyed. However, a survey that incorporates no incentives can expect a response rate no better than 20% (Verma and Mallick 1999).

4.6.1.6 Data Analysis

All three questionnaires were analysed statistically using the Statistical Package for the Social Sciences (SPSS) Version 16.0. SPSS is a software program that allows the input and analysis of data. It creates a graphical representation of the data entered and allows further analysis. It can hold a very large quantity of research data. The program is capable of quite complex statistical analysis, much more so than Microsoft Excel, making it a far more useful and desirable analysis tool.

It involves:

1. The Data Editor- data, name variables, compute new variables, and select cases are all done here.
2. The Syntax Editor- where we store & create syntax for our analyses and procedures.
3. The Output Navigator- where we view the results our statistical tests have generated.

Questions were coded appropriately and inputted into the data editor. From here it was possible to change codes if necessary, and compute the data into graphical forms.
to be viewed in the Output Navigator. From here any charts or data can be exported to Word documents and the results can be evaluated. Evaluation is “associated with the need for information for decision making in a specific setting” (Mertens 1998, p. 3).

Before evaluation could take place, all categorical and continuous variables had to be checked for errors. Any error in responses was examined and corrected, in order for preliminary analysis to take place. The normality of the distributions was assessed on the appropriate data and data was converted into graphical form. Given the nature of the data collected, and the lack of validity of the sample due to a low response rate, there was no need for further analysis, beyond the descriptive. The data collected was adequately represented in graphical and tabulated mode.

The qualitative responses were analysed manually. Themes were identified and analysed. Where possible themes were coded and input into SPSS. In other cases the variety of the responses meant that this was not possible. However, some responses “need not be explained numerically” (Basit 2003), and can be evaluated qualitatively. Further second level analysis was not conducted, as the reliability of the sample was compromised due to the poor response rate.

4.6.2 Phase 2

The second phase of the research, was informed by the results of the first phase, and sought to further examine teachers’ practices, opinions and attitudes in the context of the Transition Year Science classroom. The second phase also inquired further into the place of Science in the Transition Year by examining pupils’ experiences of the subject within the year. The features involved in this phase are discussed further over the next pages.

4.6.2.1 Questionnaire design

“The first step in carrying out a satisfactory questionnaire study is to list specific objectives to be achieved by the questionnaire” (Cohen and Manion 1994, p. 415). The core objective behind this quantitative study has been to conduct a piece of research that will answer some specific research questions. The job of surveys is, in essence, to be fact finding and descriptive. The nature of a questionnaire is to offer
generalisable results, leading the survey to be essentially a fact finding and descriptive exercise (Oppenheim 1992, p. 12). The benefits of surveys are that there is a rapid turnaround in data collection and the researcher is able to identify the attributes of a population from a small group of individuals, providing sampling is conducted correctly (Creswell 1994, p. 119).

The author, having learnt many lessons from the survey design in Phase 1, sought to make the questionnaire involved in this phase of the research uniformly workable, closely linked and informed by the research framework, and concise. Questionnaires which are well formatted, easy to answer, and that appear ‘quick’ are more likely to be completed. Research (Rubin 1994, Bell 2005, p. 144) has indicated that an excellent questionnaire may lose much of its impact if it is untidy. Well formatted questionnaires not only assist response rates, but they also can improve the probability of getting accurate responses (Balnaves and Caputi 2001, pp. 84-85). All questionnaires being designed have a common number of issues to be addressed. These issues will be discussed in this section, while the individual questionnaire designs will be addressed in further sections. The use of language in questionnaires is a key issue in all questionnaires. It is important when formulating questions in an instrument that will answer your research questions that the researcher also recognises that the questions must be clearly understood as well.

All questions used scales that were adapted from previous studies (Regan 2005, Lally 2007) or that were newly developed for this study. DeVellis (2003, pp. 67-70) recommends noting the following in scale development:

- Avoid exceptionally lengthy items, as this increases the complexity of an item and diminishes its clarity;
- The reading complexity and difficulty level of items, the researcher must consider semantic and syntactic factors;
- Avoid using multiple negatives;
- Avoid ambiguous pronoun references, as this adds to the difficulty of reading the item;
- Ensure caution when using scales with negatively worded items or positively worded items, and scales where they are mixed as these scales can often perform poorly.
All of the questionnaires developed for this phase of the study included carefully developed Likert scale items, numerical response formats, filter questions, dichotomous items, matrix response items and validation items.

**Pupil questionnaires**

The pupil questionnaire can be examined in two parts: the Transition Year Science pupil’s questionnaire and the Junior Certificate (non-Transition Year school/control) Science pupil’s questionnaire. Both questionnaires were designed in three sections. The three sections in the Transition Year pupil’s questionnaire comprised of ‘general information’, ‘Transition Year and Transition Year Science’, and ‘subjects I plan on studying for my Leaving Certificate’. Similarly the Junior Certificate Science pupil’s questionnaire consisted of a section on ‘general information’, a section on ‘the Junior Certificate and Junior Certificate Science’ and ‘subjects I plan to study for my Leaving Certificate’. While the use of language is an issue which must be considered in all survey design, it was of particular concern for the pupil questionnaires. Bell (2005, pp. 138-139) notes that while the researcher may often think that a question will be understood, particularly because as the researcher you are knowledgeable on the topic being examined, the target sample may often not understand the question at all. This issue was addressed through the piloting of the questionnaire: as it is of importance that the researcher understands the frame of reference of their target sample. This involves understanding the ambiguity that some language may present, and that individuals interpret language from their own personal experiences (Balnaves and Caputi 2001, p. 82).

**Student questionnaires**

The third level student questionnaires encompassed a variety of areas. These included the students’ reasons for taking Science, Leaving Certificate Science, the Transition Year and their Transition Year Science experiences and finally their career guidance at second level.
Teacher questionnaires
The teacher questionnaire included sections on general information. This section explored the teachers’ background and their subject specialism. The second section of the questionnaire looked at the Transition Year in their school. This examined the organisation of the year and the organisation of Science in the year. Teachers were asked about their own teaching of Transition Year Science in the third section of the survey. This involved topics like the frequency of practical work in their Transition Year Science classroom, the topics they taught and their reasons for teaching these topics and the teaching methods they employed. The final section of the questionnaire contained questions on the teachers’ feelings of preparedness to teach Transition Year Science and the resources available to them.

Piloting the questionnaires
Questionnaires should be piloted to ensure the face validity of an instrument and to improve questions, format and the scales (Creswell 1994, p. 121). The questionnaires were piloted to ensure that they were clear, and there were no sources of ambiguity. The pupil questionnaire was piloted with five pupils, three of whom were in the Transition Year, and two who were in their final year of the Junior Certificate cycle. Student questionnaires were piloted with two Leaving Certificate pupils and two 1st year third level students. Finally the teacher questionnaires were piloted with five Science teachers. This allowed the researcher to ensure that both the language and the length of the questionnaires were appropriate to the various target samples. Following the pilot, the author spoke with each participant in order to discuss any issues with the questionnaire. Issues such as content, wording of the questions and the length of the questionnaire were discussed.

Letter to sample
The cover letter of a survey study is of vital importance. It is the first impression that the target sample gets of the researchers, and the study, and it can motivate the potential respondents to take part in the research (Leedy and Ormrod 2005, pp. 193-195). All letters of introduction contained a general introduction, indicating the purpose of the research, this was followed on by an outline of what partaking in the research would involve, and the final section gave the contact details of the
researcher in case of further queries and assured confidentiality. The letter of introduction also contained clear instructions on how to answer the questionnaire and how and when to return the instrument (Balnaves and Caputi 2001, p. 84). The letters used in this phase are given in Appendix M.

**Data collection**

“The method of selecting a sample is critical to the whole research process” (Cohen and Manion 1994, p. 239, Collins *et al.* 2006, p. 83). After the poor response rate to the survey in Phase 1 of the study, careful consideration was given to the sampling of the participants for Phase 2. There are two main methods of sampling: probability and non-probability sampling (Collins *et al.* 2006). Cohen *et al.* (2007) highlight the need, when selecting a sample, for researchers to think in advance of the type of analysis they wish to perform on the sample. The statistical tests to be performed and the controllable variables are central to informing the researcher about their sample size. The third level students’ questionnaire used non-probability sampling, as only those present in the laboratory sessions had a chance of being selected. The second level pupils and teachers involved in this study were selected using random (probability) sampling, which is recommended as it is the most rigorous form of sampling. It enables the researcher to generalise their findings to an entire population (Creswell 1994, p. 119).

**Pupil questionnaire**

There are ethical issues associated with sampling school pupils under the age of eighteen, and this area of data collection had to be approached carefully. Information letters were sent to the randomly selected schools (addressed using the Science teachers’ name where possible). These information letters contained details of the study, explained what would be involved and asked the teachers to contact the researcher if they would be willing to have their pupils participate in the research. Schools were also contacted by phone to allow for the schools’ principals or teachers to speak with the researcher and ask any questions they needed clarified before agreeing to participate in the study. Pupil and teacher questionnaires were sent out to all schools who agreed to participate. The package that was sent out also included information sheets for the teachers, the guardians of the pupils and the pupils
themselves, and consent forms for the teachers and guardians. The information sheets clarified the general purpose and aims of the study, while explaining how the data would be used and assuring confidentiality.

**Student questionnaire**

Following the pilot and further revision of the questionnaire, it was distributed to all first year students of a general chemistry module at the University of Limerick. The data collection took place in the fifth week of the autumn semester in the academic calendar year 2009/2010. The questionnaires were distributed during the students’ practical laboratory sessions to ensure the best possible response rate. Attendance at this module’s lecture is not mandatory, whereas the practical sessions require student attendance. This module comprises of students from a number (17) of different degree programmes, and the large numbers (N = 400), ensures a wide coverage of Irish schools.

**Teacher questionnaire**

The list of randomly selected schools, those which offered the Transition Year and those schools which did not offer the year was compared against various databases (*Chemistry in Action!* teachers’ list; Science Magic Show teacher/schools database) in order to match as many schools with teacher names as possible. When surveys are directly addressed to respondents they are more likely to be completed (Cohen *et al.* 2007). All questionnaires sent to the schools included an information sheet explaining the purpose of the research and how the data would be used and a consent form. Teachers were also offered a booklet compiled by the researcher on Transition Year Science demonstrations and experiments. If teachers left their e-mail on the questionnaire the researcher offered to e-mail them on the booklet. This was done as an incitement, in order to obtain the best possible response rate.

4.6.2.2 The Research Sample

When selecting a research sample the researcher needs to carefully consider, in advance of any data collection, the sort of relationships that they wish to explore. One must also think about the tests to be used and the research questions to be
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answered. These considerations will all inform the researcher about their sample size. This study required pupils and students who had previously studied or who were currently studying Science in the Transition Year. In addition, the study also required pupils who had not taken the Transition Year, and therefore in turn not taken Science within the year, in order to compare cohorts of pupils who were at the same stage in their education. In order for the researcher to achieve a thorough picture of what is being experienced in the Transition Year Science class, all parties involved in the classroom must be accounted for. Therefore it was vital to this study also to survey Transition Year Science teachers. When choosing a research sample there are four vital factors to be considered: the size of the sample, the representativeness of the sample, access to the sample and the sampling strategy to be used.

Pupil questionnaire

Overall 30 schools were contacted by letter, 5 schools were schools which did not offer the Transition Year Programme, and the remaining 25 schools were Transition Year Schools. Four of the five non-Transition Year schools responded and agreed to take part in the study and pupil questionnaires were sent out to the Science teachers in these schools. However, only 3 of these schools returned the pupil questionnaires. These three schools provided 42 pupils which is 13.2% of the overall sample collected. The Transition Year schools yielded 17 responses, of which 13 returned the pupil questionnaires. This elicited 277 pupil questionnaires, which is 86.8% of the total sample collected.

Student questionnaire

The general chemistry module surveyed has a register of four hundred students. Students were surveyed in their laboratory sessions, in order to elicit the highest possible response rate. Lectures are not compulsory for this module, but the laboratory sessions are and therefore traditionally have a much higher level of attendance. Three hundred and fifty five questionnaires were returned in these sessions, giving a response rate of 88.75%
Teacher questionnaire

The teacher questionnaire was sent out to 135 schools, which included those teachers who agreed for their pupils to participate in the pupil questionnaire. Initial response rates were low, so a reminder was sent to the teachers after the first round of surveying, along with new questionnaires, in case the previous ones had been misplaced. Eighty teachers in total responded to the survey, giving a response rate of 59.3%.

4.6.2.3 Data analysis

The data collected from all surveys was analysed using the statistical software package SPSS (Statistical Package for the Social Sciences version 16.0 for Windows) and PASW (Predictive Analytics Software version 17.0 for Windows). PASW is the upgraded, renamed SPSS; files which were originally in SPSS were transferred in their entirety from one software package to the other. The analysis procedure was the same for all questionnaires, which is why this section will deal with the analysis as a whole, rather than examining each questionnaire individually. All questions were coded, as were the responses, and entered into SPSS or PASW using these codes. When all data had been entered into the software package, initial frequency checks were carried out to detect coding errors in the data. Once any errors had been rectified a first level analysis was carried out. This first level analysis involved the data being depicted using graphical representations such as frequency tables and bar charts. Cross tabulations, histograms, and box plots were all also used. When the author considered it necessary, Pearson’s correlation coefficient was used to check for correlations. As discussed in the section on reliability in this chapter, the reliability of scales was assessed using Cronbach Alpha scores. Having completed these initial tasks, a second level (inferential statistics) analysis was carried out. Correlations using Pearson’s correlation coefficient were performed. Whether or not data was considered to be parametric was considered from the first level analysis and depending on the type of data independent sample t-tests, paired sample t-tests, Mann-Whitney U, One way ANOVA and Kruskal-Wallis were interrogated and means were compared (Field 2009). The findings of this data analysis are discussed in detail in the results chapters.
4.6.3 Phase 3

Phase 3, was the final stage of the research and was conducted alongside Phase 2. The author believed that in order to achieve the depth of treatment of the subject area being examined the qualitative approach had to be employed in Phase 3 of the study. This phase required the author to conduct Case Studies in selected schools, which also involved interviewing both Transition Year Science teachers, and Transition Year Co-ordinators.

4.6.3.1 Case Study and Case Study Design

Yin (1994, p. 1) notes that:

“In general, case studies are the preferred strategy when ‘how’ or ‘why’ questions are being posed, when the investigator has little control over events, and when the focus is on a contemporary phenomenon within some real-life context.”

Case studies are being more and more commonly used as research tools as they allow “an investigation to retain the holistic and meaningful characteristics of real life events” (Yin 1994, p. 3). The purpose of a case study is to “probe deeply and to analyse intensively the multifarious phenomena that constitute the life cycle of the unit” in order to establish generalisations regarding the population of the unit (Cohen and Manion 1994, pp. 106-107). The researcher typically collects extensive data on the individuals, programmes or events on which the investigation is focused. In this case the ‘unit’ is Transition Year Science. The case study must be closely aligned with the research framework and questions.

There are three types of case studies: exploratory, descriptive or explanatory. There are a further three conditions which determine which of these models should be employed in a study. These conditions are:

- The type of research question posed;
- The extent of control an investigator has over actual behavioural events;
- The degree of focus on contemporary as opposed to historical events.

(Yin 1994, p. 4)

Based on the aforementioned criteria, this study has employed the exploratory case study. This model aligns most closely with the overall research design, though
elements of the descriptive and explanatory were drawn upon throughout the case study. Criticisms of the case study have noted there may be a lack of rigour applied to the study, that it is difficult to cross-check information, and that there may be selective or biased reporting. There is also little basis for scientific generalisations in a case study (Yin 1994, p. 9, Bell 2005, p. 11). It was for these reasons that it was decided that Phase two and three would run simultaneously and that interviews would be a central component of the case studies.

There are two types of observation involved in a case study: participant observation and non-participant observation. Participant observation involves the researcher engaging in the very activities which they set out to observe. Non-participant observation requires the participant to stand aloof from the group activities they are investigating and eschew group membership. This study employed non-participant observation, as it best suited the requirements of the research. The data collected in a case study often includes “observations, interviews, documents, past records, and audiovisual materials” (Leedy and Ormrod 2005, p. 135). The data collected in this piece of research was gathered through interviews with Transition Year Science teachers and Transition Year Co-ordinators, collection of school documents related to the Transition Year and Science within the year, and past enrolment records. Other factors examined in this research were school type, gender, size, the socio-economic profile of the school, length of time the school has offered the Transition Year, whether the year is compulsory or optional, whether the school also offers the Leaving Certificate Applied (LCA), if there is a previous history with curriculum development, the duration of the principal in the post, the duration of the Transition Year co-ordinator in the post, teachers’ participation in Transition Year specific in-career education, and the schools’ previous engagement with the second level support service.
Yin (1994, p. 20) advises that a case study design be directed by the following guidelines:

- The study’s questions;
- The study’s propositions, if any;
- The unit(s) of analysis;
- The logic linking the data to the propositions;
- The criteria for interpreting the findings.

In the instance of this study, the ‘case’ consists of the Transition Year schools identified by the author to conduct exploratory work in. The case includes the schools, the Transition Year Science teachers and Co-ordinators, documentation from the schools regarding enrolment, Science, and timetabling. Specific time boundaries were set for conducting the ‘case’, which allowed the author to spend a day in each school. There was also a role for theory with the design of the case study being guided by the literature in the area (Jeffers 2002, Smyth et al. 2004, Regan 2005, Jeffers 2007b; 2008).

The author approached the case study as an ‘outsider’, looking in as an objective assessor of the Transition Year. Schools are invented and socially constructed realities. The Transition Year schools devise their own programme and timetables, therefore there will be subtle or obvious differences and variations within each school, despite them displaying many overall similarities. Case studies are challenging and time consuming: typically there is a significant amount of information generated, and they may often take years to complete. In this instance the case studies were utilised as a follow-up to Phase 1 of the research to “put flesh to the bones of a survey” (Bell 2005, p. 10). This case study aimed to identify the features of an exemplar Transition Year Science programme.

4.6.3.2 Interviews

As a research tool interviews fall within the qualitative domain. They allow for a greater depth of insight into a subject than one would get with other methods of data collection. The interview can take a variety of forms. A structured interview requires the content and procedures of the interview to be organised in advance. The interviewer is left with very little freedom to make modifications at any point
throughout the interview. Semi-structured interviews involve a standard set of interview questions. However, unlike the structured interview there may be one or two more individually tailored questions incorporated in order to get clarification or probe a response further (Leedy and Ormrod 2005, p. 184). An unstructured interview is conducted in a very open situation, with the interviewer free to change the direction of the interview as they see fit. While an unstructured interview can offer a great deal of flexibility and freedom for the researcher it is very difficult for new researchers to conduct one (Leedy and Ormrod 2005, pp. 146-150).

The style of interviewing chosen by the author for this study was that of a semi-structured interview, for the reasons outlined above. This style has a few distinct characteristics, which the author felt were of particular value to this study. Within a semi-structured interview the interviewer has an interview schedule, with a pre-worked out set of open ended questions. However, the interviewer is free to modify the order of the questions, change the wording, or perhaps leave out particular questions as well as probing responses further. This offers flexibility, encourages freedom of expression from respondents and allows the respondent to clarify ambiguous answers and when appropriate, for the interviewer to seek follow-up information (Rubin and Rubin 1995, Cohen et al. 2000, Leedy and Ormrod 2005).

Leedy and Ormrod, (2005, pp. 187-188) suggest adhering to the following guidelines for a successful interview process:

- Ensure that the interviews are representative of the group;
- Find a suitable location;
- Get written permission;
- Establish and maintain a rapport with the interviewee;
- Focus on the ‘actual’ rather than the abstract or hypothetical;
- Do not put words in the interviewee’s mouths;
- Record responses verbatim;
- Keep your reactions to the interviewee’s statements/responses to yourself;
- Remember that you are not necessarily getting the facts.

The interview questions used in this study were developed from Jeffers (2008) and Regan (2005) and findings from the teacher questionnaire used in Phase 1. The interviews were a tool through which to validate other research methods, and gain a
further depth of understanding about the place of Science in ‘successful’ schools. The questions were also developed from issues, that the author wished to examine further, that arose in Phase 1 of the study. The final interview schedules for both the Transition Year Science teachers and Co-ordinators are available in Appendices F and G respectively.

4.6.3.3 Piloting the interview instrument

It is of significant value to run a preliminary test of an interview schedule, as it can help to clarify issues associated with the design of the interview. In order to focus the interview schedule, and to ensure that the research questions were being adequately addressed it was decided to pilot both interviews. This involved administering the interview schedule with three Science teachers and one Transition Year Coordinator in order to uncover any possible sources of ambiguity or other issues with the interview schedule. The good design, measurement and administration of an interview schedule should reduce bias and possible errors in the data (Balnaves and Caputi 2001, p. 87).

4.6.3.4 Research Sample

Schools were chosen from two lists: one which identified the top 35 schools nationally for uptake of Leaving Certificate chemistry as a percentage of the total cohort, (Waldron 2009) and the other from a list of schools that had previously been identified by the author and her colleagues as ones which displayed distinctively good practice in Transition Year Science. From these lists, schools were randomly selected and contacted. The final sample consisted of seven schools, which both the interviews and case studies were conducted in. Thirteen people were interviewed within these schools.
### Table 4.3: Case Study schools in research sample

<table>
<thead>
<tr>
<th>School</th>
<th>School Type</th>
<th>School Gender</th>
<th>Fee paying</th>
<th>List</th>
<th>Individuals Interviewed</th>
</tr>
</thead>
<tbody>
<tr>
<td>School 1</td>
<td>Secondary</td>
<td>Single-sex boys</td>
<td>No</td>
<td>T.Y. Exemplar</td>
<td>TY Science teacher and Co-ordinator</td>
</tr>
<tr>
<td>School 3</td>
<td>Secondary</td>
<td>Mixed (primarily girls)</td>
<td>No</td>
<td>T.Y. Exemplar</td>
<td>TY Science teacher and Co-ordinator (same individual)</td>
</tr>
<tr>
<td>School 4</td>
<td>Secondary</td>
<td>Mixed</td>
<td>Yes</td>
<td>Top 35 for uptake of L.C. chemistry</td>
<td>TY Science teacher and Co-ordinator (School Principal)</td>
</tr>
<tr>
<td>School 6</td>
<td>Vocational</td>
<td>Mixed</td>
<td>No</td>
<td>Top 35 for uptake of L.C. chemistry</td>
<td>TY Science teacher and Co-ordinator</td>
</tr>
<tr>
<td>School 7</td>
<td>Secondary</td>
<td>Mixed</td>
<td>Yes</td>
<td>T.Y. Exemplar</td>
<td>TY Science teacher, Co-ordinator and previous TY Co-ordinator</td>
</tr>
</tbody>
</table>
4.6.3.5 Data collection

Schools were chosen on the basis of their having been previously identified as displaying distinctively good practice in Transition Year Science or from a list (compiled from figures from the Department of Education and Science\(^6\)) of schools who had above average uptake of Leaving Certificate Chemistry (Waldron 2009). “The idea of qualitative research is to purposefully select informants (or documents or material) that will best answer the research question. No attempt is made to randomly select informants” (Creswell 1994, p. 148). Originally, the author had hoped to conduct case studies in three categories of schools: schools which had previously displayed distinctively good practice in Transition Year Science, schools that did not embody the Transition Year ethos, but taught Science from the Leaving Certificate Science syllabi, and a randomly selected sample. However, due to time constraints and difficulties with getting permission from certain schools, the researcher was unable to include these three categories in the case study. Schools were contacted initially by letter, (see Appendix I) to invite them to participate in the research. This was followed up with a phone call to the schools and a date and time was set with those who agreed to participate with the research.

Thirteen semi-structured interviews were carried out, as part of the case study, between November 2009 and October 2010. The interviews took place in a location of the respondents’ choosing in schools around the country. Face-to-face interviews were carried out, rather than telephone interviews. Face-to-face interviews have the distinct advantage of enabling the researcher to establish a rapport with the participant. This can help enormously in gaining trust and cooperation, thus such interviews tend to yield the highest response rates (Leedy and Ormrod 2005, pp. 184-185). They also allow the interviewer greater flexibility, in terms of presenting information to the participants. Interviews were recorded, with the interviewee’s permission, using an IC recorder. One participant did want to take part in the study, but did not want their interview recorded. In this instance the author took notes by hand of the interview. Once the interviews were complete they were transferred to

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\(^6\) This list was compiled by Dr. Peter E. Childs, in order to investigate the features that promoted high uptake in Chemistry at senior cycle among Irish schools. Schools were randomly selected from this list, as the study by Waldron ((Waldron 2009)) indicated that a good Transition Year Science programme was an important feature of schools who had high uptake of Chemistry at senior cycle.
Consort 2.1. (PC software used to convert the audio files into ones which can be played on a variety of media players) Once the interview had taken place, and been converted, they were transcribed and saved as a Word document. This allowed the author to import the interviews into NVivo, a software analysis programme for the analysis of qualitative data.

4.6.3.6  **Interview Data Analysis**

As the data was collected it was transcribed and examined for emerging themes. Kvale and Brinkman (2009, p. 13) recommended that seven steps of an interview inquiry be followed, the outline of the basic steps, which were followed in this process, are given here:

- Thematizing
- Designing
- Interviewing
- Transcribing
- Analysing
- Verifying
- Reporting

This involves the researcher making sense of the data by using methods which are appropriate to the study. Glasser and Strauss’ (1967) constant comparative method was the main method through which the data was analysed. The author looked for evidence of non-conformance in the data, which may necessitate a change or a revision of categories. The constant comparative method involves coding of the data in order to organise and understand it. This method was supported by the use of NVivo, a qualitative analysis software package. This tool aids the qualitative researcher with the analysis of their data. Emerging themes were examined, and data was re-categorised if deemed necessary. As the interviews had been developed under the framework of the research questions and as an element of a case study, they were guided by these objectives. After the interviews had taken place the recordings were transferred to file converting PC software, saved as Word documents and imported to NVivo. The analysis of the interviews took place using an initial list of themes which were based on the main sections of the interviews as described previously. All
NVivo codes were based on this list. Items were then re-categorised or restructured into new nodes, as new themes emerged.

4.6.3.7 Case Study Data Analysis

Leedy and Ormrod (2005, p. 136) note that the data analysis involved in a case study involves the following steps:

- **Organisation of details about the case**, this involves arranging the specific ‘facts’ about the case in a logical order.

- **The categorization of data**, this process entails identifying categories that can help cluster the data into meaningful groups.

- **Interpretation of single instances**, specific documents, occurrences and other bits of data are examined for the specific meanings that they might have in relation to the case.

- **Identification of patterns**, the data and their interpretations are scrutinized for underlying themes and other patterns that characterise the case more broadly than a single piece of information can reveal.

- **Synthesis and generalisations**, this stage furnishes the researcher with an overall image of the case. Conclusions are drawn from this overall depiction of the cases, which may have implications beyond the specific case from which it was drawn.

The steps mentioned above were closely adhered to, with schools being grouped by type, the list they came from, gender, size, and the socio-economic profile of the school, length of time the school has offered the Transition Year, whether the year is compulsory or optional, the data generated through the interviews and prior Science enrolments. Through this organisation and categorization of data, interpretation of other documents and information (single instances) provided by case study schools was examined for their specific meanings.

Pattern matching and explanation building models were applied to the data (Yin 1994, p. 106). Patterns were identified and underlying themes emerged, leading to the stage of synthesis and generalisation. The analysis relied on all the relevant evidence collected through the course of the case study. It included all major rival interpretations of the data, in order to promote a rigorous processing of the data. The analysis also addressed the most significant aspects of the case study and the
researcher’s own prior, expert knowledge of the subject was brought to the analysis. Yin (1994, pp. 123-124) suggests that these elements make for a difficult, but truthful analysis of a case study.

4.7 Validity and Reliability

If the results gathered from the research conducted is to be meaningful then it must have meaning beyond the scope of this research. This quest for meaningful research leads us to the issues of validity and reliability.

The data gathered from the quantitative research methods by its very nature allows for an objective examination of validity and reliability. However, this is not always the case with qualitative data, which is more subjective and open to interpretation. This is not to say that validity and reliability cannot be achieved with qualitative data, rather that one must take consideration of the ways in which researchers have found to overcome this issue. Validity and reliability in research allows us to draw meaningful conclusions from our data (Leedy and Ormrod 2005, p. 29). In order to achieve a high degree of validity and reliability in this research the author has utilised a mixed method approach, to allow for multiple sources of data and triangulation between the data sources.

4.7.1 Validity

Validity can be characterised as “the extent to which the instrument measures what it is supposed to measure” (Leedy and Ormrod 2005, p. 31). It is often thought of more as a positivist construct, rather than as an interpretivist one, in that it is applied more to quantitative research than qualitative (Cohen et al. 2007). It has been suggested that the term ‘understanding’, rather than validity is more appropriate for qualitative research (Cohen et al. 2007, p. 134).

4.7.2 Internal validity

Internal validity is concerned with the sustainability of the event, issue or data set that a piece of research provides. It is mainly related to the issue of causality, which is concerned with whether a casual relationship between two or more variables holds
true. There are various approaches that are suggested to show that research findings can be sustained by the data gathered (Cohen et al. 2007, p. 135). The approach utilised in this study was a mixed method one. The variety of sources of data collection, the use of questionnaires, interviews and case studies all add to the internal validity of the study. The author has dealt with the issue of causality through careful analysis of the results, according to the literature, and by obtaining advice in both the implementation of quantitative and qualitative approaches and the analysis of both approaches, from experts in the fields.

4.7.3 External validity

The external validity of a study is concerned with the generalisability of the results to the broader population (Cohen et al. 2007, p. 135). In order to address the issues posed by this the purpose of the study must be examined. The overall aim of this piece of research is to give a broad overview of the treatment of Science in the Transition Year, and to examine the effects of taking the year on students’ further study of Science. This is a uniquely Irish study, and therefore is not applicable in the wider sense to the international community. However, findings from this study may suggest ways in which the approaches to the teaching and learning of Science as a whole may be adopted and utilised to promote a broader understanding of the subject. Keeping the overall perspective of the study in mind when deciding on the research approaches to be taken enhances the validity of the study. Methods which have been employed in this study, to allow for the generalisability of the results, have been the collection of data from a broad range of sources. Second level schools have been randomly selected from a national database for both the student and teacher surveys; third level students were sampled from a wide variety of courses within the area of Science, and represent a range of schools and geographical locations. The researcher must ask themselves whether, if another researcher were to use their research instrument and ask factual questions, would they be likely to get similar responses (Bell 2005, p. 118).
4.7.4 Reliability

“Reliability is the extent to which a test or procedure produces similar results under constant conditions on all occasions” (Bell 2005, p. 117). The implications of this are that if the research was repeated by another, then one would expect to see a high level of correlation between the results.

4.7.5 Quantitative reliability

A quantitative approach allows for reliability to be tested for more easily than a qualitative approach; however, steps must still be taken to ensure that the highest level of reliability possible be reached. Certain practices were introduced to the study to ensure reliability was achieved. The researcher sampled a large population, and varied those who were sampled. Approximately 350 third level students were sampled, while strenuous attempts were made to achieve a sample of between 300 and 400 of second level pupils. The initial teacher questionnaire was considered relatively unreliable due to the poor and possibly self-selecting response rate. The second teacher questionnaire was therefore carefully designed, piloted and sent to a randomly selected sample, which proved to be representative of the school population as a whole. Cronbach’s alpha was used as a measure of internal reliability. Cronbach’s alpha is a statistical test, which examines how well items on a scale correlate with one another (Field 2009). These values were calculated to indicate the reliability of each scale used in the questionnaires, using the data collected. For example, the scales in the pupil questionnaires were examined, and a Cronbach alpha score of 0.752 was obtained. Scales in the teacher’s questionnaire in Phase 2 of the study, such as question 16, received a Cronbach alpha score of 0.806. Scores above 0.7 are considered satisfactory (Field 2009).

4.7.6 Qualitative reliability

It is more difficult to address reliability for qualitative data; therefore a rigorous approach to data collection must be taken. Mertens (1998, p. 288) suggests that unsystematic error may occur in the research study. These errors may occur with the person being measured, with the conditions of administration and through changes in
the research instrument. In order to minimise this source of error the author focused on those which were under her control, the conditions of administration and the research instrument. Semi-structured interviews were used for the collection of qualitative data, and this was an important factor in maintaining the reliability of the data. This allowed the author to ask the same questions to each interviewee, while allowing for discussion. A careful interview protocol was also observed for the interview structure and procedure.

4.8 Triangulation

One of the key goals of researchers is to allow for the best possible level of confidence in their results. This goal is often achieved through triangulation. Triangulation has been defined as the use of two or more methods of data collection within a research study (Cohen et al. 2007, p. 141). The basic premise behind triangulation is to see the same thing from a variety of different perspectives and therefore be able to confirm or challenge the findings of one method with those of another, leading to a convergence of results (Laws 2003, p. 81 cited in Bell 2005, p. 116). Triangular techniques were employed in this study, to reduce any potential bias in the research and to increase its credibility.

Different types of triangulation were implemented by the author in this study. Denzin (1970, cited in Balnaves and Caputi 2001, pp. 95-96) has suggested four types of triangulation:

- Data triangulation;
- Investigator triangulation;
- Theoretical triangulation;
- Methodological triangulation.

This study used data, methodological and theoretical triangulation. The combined use of these three methods of triangulation allowed the author to map out the richness and complexity of the data. Data was obtained from pupils, students, Transition Year Science teachers and Transition Year Co-ordinators. Both qualitative
and quantitative methodological approaches were used during data collection, and the data that was collected was analysed under a variety of theoretical perspectives.

The research instruments employed in this study were questionnaires, data collection, and interviews with Transition Year Science teachers and Co-ordinators. The data collection and interviews were elements of the case studies.

The author felt that triangulation was important to this study in order to evaluate the experiences of both the teachers and the pupils (both present and past (third level students)) involved in Transition Year Science. The author wanted to gain a more holistic view of the complex phenomenon of Transition Year Science; this needed to incorporate the various elements of triangulation.

4.9 Ethics

Researchers, in their search for further knowledge and understanding must also be aware of their responsibility for the wellbeing of the participants of the study. The use of human subjects is a common feature of educational research. When engaging in research, particularly with human subjects, ethical codes must be acknowledged and adhered to. Opie (2004, pp. 24-25) notes the importance of ethical considerations and these were taken on board when applying for ethics approval for the project. Ethical issues that arose within the study were acknowledged and addressed by the author before any field research took place. In the University of Limerick research involving human subjects requires approval prior to the study’s commencement. Approval is granted or denied by the University of Limerick Research Ethics Committee (ULREC). ULREC requests information, based on the guidelines from the Department of Health (Standard Operating Procedures for Local Research Ethics Committees, April, 1994).

Once the ethical issues involved in the study had been recognised, they were addressed while adhering to the ULREC guidelines. An application to conduct research through teacher questionnaires in schools was granted in early May 2008 for the period of the research. A second application was made in July 2009; and further data collection did not take place until the application was approved. The nature of
this study, its methods of data collection, from various different sources and using different methods, led to a wide variety of ethical issues for the different participants.

4.9.1 Ethical issues in the quantitative study

Having gained approval of both applications to the ULREC, the issues that arose from the quantitative component of the study were addressed. These issues differed for each of the participants. Data collection involving pupils led the author to recognise issues of child protection and informed consent. The ULREC guidelines state that when involving participants under the age of 18 in a study, the researcher must make himself or herself aware of the University of Limerick’s policy on child protection, and agree to adhere to this policy, safely, with only the researcher having access to the data.

Parental and school consent was sought before the second level pupils were sampled; pupils were also informed of the process and allowed to withdraw at any time. All participants in the study read information sheets and signed consent forms. The consent forms described the research, and the implications of participation. Data was stored in a safe manner, in order to further protect confidentiality and anonymity. Similar techniques were employed by the author when sampling the third level students and teachers. However, these participants were over the age of 18. University guidelines were followed in obtaining all data and participants were assured of confidentiality. All participation in the study was voluntary, participants were guaranteed anonymity and the confidentiality of data was ensured. Participants have the right to refuse to take part in the study or to withdraw once they have taken part. Once the data was collected, entries into the statistical analysis package were coded to further guarantee anonymity. Analysis was carried out to the highest possible standards, using Statistical Package for the Social Sciences (SPSS Version 17.0 for Windows).

4.9.2 Ethical issues in the qualitative study

The researcher recognised the possible effect of her presence on the research setting, and tried to ensure that the experience was as smooth as possible for the participants. Cohen et al. (2007, p. 382) noted that the main ethical issues involved in interviews
are “informed consent, confidentiality and the consequences of the interview”. This ethical dimension to interviews comes from the fact that they “concern interpersonal interaction and produce information about the human condition” (Cohen et al. 2007, p. 382). Interviewees were initially contacted through letter; this was followed up by a phone call, in order to answer any questions they might have had and to outline their role in the interview. Information sheets were provided at all interviews, and participants were asked to read the information sheets carefully before signing the form consenting to the interview. Interview participants were guaranteed confidentiality and anonymity, all interviews were numerically coded and these codes are used throughout the further chapters describing the data (Leedy and Ormrod 2005, pp. 101-102). The researcher made participants aware of how the data would be used, and ensured that the data was interpreted in a non-biased manner, and that the analysis was as accurate as possible.

4.10 Limitations

All research has limitations, despite a researchers best efforts to minimise them as much as possible. The limitations of this study are the factors which could not be controlled by the author.

The results gathered in Phase 1 were considered unreliable, as considering the size of the study (514 schools), the response rate was low in numbers, with only 17.1% of the cohort responding. If the number of respondents had been greater it would have greatly increased the reliability of the results. Perhaps a reason for this was the length of the initial teacher questionnaire, which may have been daunting to teachers. This was rectified in the re-sampling of teachers in Phase 2. It is possible that one stratum of a carefully selected sample can respond more than others (Wellington 2000).

Schools chosen to participate in the research are also recognised as being both a factor controlled by the author, and also one which the author had little control over. Schools offering the Transition Year were chosen to be surveyed from a Department of Education and Science schools list. This was due to the study setting out to specifically capture data from teachers and pupils, who were involved in Science in the Transition Year. The research originally hoped to focus the case study on all types of schools offering the Transition Year, but due to the reluctance of certain
schools (schools known to the author to use the Transition Year as an extra Leaving Certificate year) to participate in the study the author adapted the research to include specific schools in the case studies. The author believes that this is compensated for by the richness and variety of the data produced in the study.

4.11 Summary

This chapter has provided a framework for the research study. The author’s stance in the approach to the research was set out and examined through the discussion of the theoretical framework that guided the research and the various research methodologies employed in the study. This framework was used to discuss the research paradigms which were presented. The methodological design of the study was explained, through outlining how it was utilised to achieve the research goals. The author discussed the relationship between the research design and the theoretical framework. The overall purpose and intent of the research was also reviewed. Under this context the research phases were broken down and discussed. This chapter also examined the issues of validity, reliability, triangulation, ethics and the limitations that arose during the course of the research. The research questions and aims which were discussed in this chapter give a framework for their further discussion in further chapters, as the author attempts to answer the research questions. The following chapters will provide a statistical analysis of that data that was collected, while examining the qualitative data and expanding on the themes that were recognised within it.
CHAPTER 5: SCHOOLS RESULTS
5.1 Introduction

This chapter is the first results chapter and aims to present an overall picture of the type of schools that offer the Transition Year, and how the year is offered within schools. The primary focus of this chapter is to examine how both the year and Science in the year is both offered and organised in the schools. In order to gain a full and comprehensive picture of how schools operate their Transition Year, and particularly how they offer Science within the year, data from all instruments involved in this study are reported in this chapter. In order to achieve this goal and for clarity, the results in this chapter are presented in three sections: the pupils’ perspective, the teachers’ perspective and the profiles of the Case Study schools. The results from the pupils’ section of this chapter are broken down into two sub-parts: results from the pupils’ questionnaire, and results from the third level students’ questionnaire. Similarly the teachers’ section is broken down into two sub-parts comprising of the results from the teacher questionnaire carried out in Phase 1 of the study, and results from the teacher questionnaire carried out in Phase 2. The final section of the chapter, the case studies section, presents the results gathered from the seven case studies carried out in schools in Phase 3 of this research study. This section presents data from the schools themselves, building a general profile of the schools, based on the interviews with the Transition Year Co-ordinators, and the Interviews with the Transition Year Science teachers.

5.2 Section 1: Pupil and Student questionnaires

5.2.1 Pupil questionnaires Introduction

The second level pupils examined in this sample (N = 319) come from two groups. The main body of pupils (N = 277) have been surveyed at the end of their Transition Year, and are attending a school which offers the Transition Year programme. The control group for this sample were pupils at the end of their Junior Cycle education (N = 42) in schools that do not offer the Transition Year programme. The questionnaire was similar for both groups, exploring attitudes and feelings towards science, so that the two groups could be compared. It also sought to identify
how the science in the Transition Year was being utilised in the schools that offer the programme.

Twenty seven schools offering the Transition Year were selected from the Department of Education and Science schools list. These schools were contacted via letter and phone call and seventeen schools indicated that they would be willing to take part in the study. Thirteen of these seventeen schools sent back questionnaires, giving a response rate of 76.5%. Six schools which did not offer the Transition Year Programme were randomly selected from the Department of Education and Science schools list. Three of these schools responded (50.0% response rate).

5.2.1.1 School profiles

Random sampling was employed in order to achieve a representative sample of schools in this study. The following Tables (Table’s 5.1 and 5.2) present the breakdown of the schools involved in the study, and compare them to the national averages. The breakdown of the schools that the pupils involved in this study attended are laid out in Table 5.1.
<table>
<thead>
<tr>
<th>School Type</th>
<th>Secondary school %</th>
<th>Vocational school %</th>
<th>Community and comprehensive school %</th>
<th>Single – sex female school %</th>
<th>Single – sex male school %</th>
<th>Co-educational school %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Whole cohort (n = 319)</td>
<td>60.2</td>
<td>24.5</td>
<td>15.4</td>
<td>23.2</td>
<td>10.3</td>
<td>66.5</td>
</tr>
<tr>
<td>Transition Year is offered (n = 277)</td>
<td>60.6</td>
<td>21.7</td>
<td>17.7</td>
<td>26.7</td>
<td>11.9</td>
<td>61.4</td>
</tr>
<tr>
<td>Transition Year is not offered (n = 42)</td>
<td>57.1</td>
<td>42.9</td>
<td>------</td>
<td>------</td>
<td>------</td>
<td>100</td>
</tr>
<tr>
<td>National average (Transition Year schools)</td>
<td>61.8</td>
<td>23.9</td>
<td>13.9</td>
<td>24.1</td>
<td>16.8</td>
<td>59.1</td>
</tr>
<tr>
<td>National average (pupils in school types) (All second level schools)</td>
<td>52.8</td>
<td>31.7</td>
<td>15.5</td>
<td>20.6</td>
<td>14.8</td>
<td>64.6</td>
</tr>
</tbody>
</table>
5.2.2 Provision of Science subjects in Transition Year schools

The purpose of this section is to examine the provision of Science subjects in the schools that offer the Transition Year, in order to establish whether there is an equal level of opportunity to try these subjects. It was deemed necessary to examine this area, as previous national studies (Smyth et al. 2004) have shown an unequal provision of Science subjects in Irish second level schools. Chi-square tests were carried out on the data, after preliminary explorations had been completed, in order to verify if these preliminary findings were significant. This data is presented in Table 5.2 below.

<table>
<thead>
<tr>
<th>Subject</th>
<th>Secondary School (n = 166)</th>
<th>Vocational School (n = 60)</th>
<th>Community and Comprehensive School (n = 49)</th>
<th>$\chi^2$</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physics</td>
<td>120 (72.3%)</td>
<td>18 (30.0%)</td>
<td>27 (55.1%)</td>
<td>33.436</td>
<td>0.000</td>
</tr>
<tr>
<td>Chemistry</td>
<td>114 (68.7%)</td>
<td>1 (1.7%)</td>
<td>27 (55.1%)</td>
<td>79.524</td>
<td>0.000</td>
</tr>
<tr>
<td>Biology</td>
<td>124 (74.7%)</td>
<td>22 (36.7%)</td>
<td>31 (63.3%)</td>
<td>27.823</td>
<td>0.000</td>
</tr>
<tr>
<td>Agricultural Science</td>
<td>7 (4.2%)</td>
<td>17 (28.3%)</td>
<td>4 (8.2%)</td>
<td>28.293</td>
<td>0.000</td>
</tr>
<tr>
<td>Physics &amp; Chemistry</td>
<td>1 (0.6%)</td>
<td>21 (35.0%)</td>
<td>0</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>General Science taster</td>
<td>43 (25.9%)</td>
<td>20 (33.3%)</td>
<td>34 (69.4%)</td>
<td>31.202</td>
<td>0.000</td>
</tr>
</tbody>
</table>

It is clear that there is an unequal provision of all Science subjects in the various school types which offer the Transition Year. No subject was offered uniformly in all schools. There may be various reasons for this, such as the differences in how Science within the year is organised, with some schools offering the individual subjects, while others may offer a general Science taster programme, similar to the Junior Certificate Science programme.
Further Chi-square tests were carried out examining whether the Science subjects that pupils took were significantly different across their type of school.

Table 5.3: Science subjects offered in Transition Year by school gender.

<table>
<thead>
<tr>
<th></th>
<th>Single-sex male (n = 33)</th>
<th>Single-sex female (n = 74)</th>
<th>Co-educational (n = 168)</th>
<th>$\chi^2$</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physics</td>
<td>27 (81.8%)</td>
<td>59 (79.7%)</td>
<td>79 (47.0%)</td>
<td>30.334</td>
<td>0.000</td>
</tr>
<tr>
<td>Chemistry</td>
<td>28 (84.8%)</td>
<td>59 (79.7%)</td>
<td>55 (32.7%)</td>
<td>61.998</td>
<td>0.000</td>
</tr>
<tr>
<td>Biology</td>
<td>29 (87.9%)</td>
<td>59 (79.7%)</td>
<td>89 (53.0%)</td>
<td>25.071</td>
<td>0.000</td>
</tr>
<tr>
<td>Agricultural Science</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physics &amp; Chemistry</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>22 (13.1%)</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>General Science taster</td>
<td>6 (18.2%)</td>
<td>18 (24.3%)</td>
<td>74 (44.0%)</td>
<td>13.694</td>
<td>0.001</td>
</tr>
</tbody>
</table>

The provision of the individual Science subjects (Physics, Chemistry and Biology) is higher in the Single-sex schools, when compared to the Co-educational schools. This trend continues, and it is seen that the Co-educational schools tend to offer a general science taster, rather than the individual science subjects in the Transition Year.
Table 5.4: Science subjects taken by pupils in the Transition Year by school type.

<table>
<thead>
<tr>
<th>Subject</th>
<th>Secondary (n = 166)</th>
<th>Vocational (n = 60)</th>
<th>Community and comprehensive (n = 49)</th>
<th>$\chi^2$</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physics</td>
<td>96 (57.8%)</td>
<td>19 (31.7%)</td>
<td>22 (44.9%)</td>
<td>12.646</td>
<td>0.000</td>
</tr>
<tr>
<td>Chemistry</td>
<td>95 (57.2%)</td>
<td>2 (3.3%)</td>
<td>25 (51.0%)</td>
<td>52.935</td>
<td>0.000</td>
</tr>
<tr>
<td>Biology</td>
<td>122 (73.5%)</td>
<td>23 (38.3%)</td>
<td>28 (57.1%)</td>
<td>24.119</td>
<td>0.000</td>
</tr>
<tr>
<td>Agricultural Science</td>
<td>5 (3.0%)</td>
<td>16 (26.7%)</td>
<td>1 (2.0%)</td>
<td>36.381</td>
<td>0.000</td>
</tr>
<tr>
<td>Physics &amp; Chemistry</td>
<td>0 (0.0%)</td>
<td>21 (35.0%)</td>
<td>0 (0.0%)</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>General Science taster</td>
<td>42 (25.3%)</td>
<td>20 (33.3%)</td>
<td>33 (67.3%)</td>
<td>29.629</td>
<td>0.000</td>
</tr>
</tbody>
</table>

Not surprisingly, given the provision of the Science subjects in the schools, the uptake of the individual Science subjects in the Transition Year is significantly higher in the Secondary schools, when compared with the Vocational and the Community and Comprehensive schools. The provision of the Science subjects in the schools was a significant factor in the uptake of the subjects during the year (p < 0.001).
### Table 5.5: Science subjects taken by pupils in the Transition Year by school gender

<table>
<thead>
<tr>
<th>Subject</th>
<th>Single-sex male (n = 33)</th>
<th>Single-sex female (n = 74)</th>
<th>Co-educational (n = 168)</th>
<th>χ²</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physics</td>
<td>8 (24.2%)</td>
<td>59 (79.7%)</td>
<td>70 (41.7%)</td>
<td>39.583</td>
<td>0.000</td>
</tr>
<tr>
<td>Chemistry</td>
<td>11 (33.3%)</td>
<td>59 (79.7%)</td>
<td>52 (31.0%)</td>
<td>51.368</td>
<td>0.000</td>
</tr>
<tr>
<td>Biology</td>
<td>28 (84.8%)</td>
<td>59 (79.7%)</td>
<td>86 (51.2%)</td>
<td>25.668</td>
<td>0.000</td>
</tr>
<tr>
<td>Agricultural Science</td>
<td>3 (9.1%)</td>
<td>0 (0.0%)</td>
<td>19 (11.3%)</td>
<td>8.998</td>
<td>0.013</td>
</tr>
<tr>
<td>Physics &amp; Chemistry</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>21 (12.5%)</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>General Science taster</td>
<td>6 (18.2%)</td>
<td>17 (23.0%)</td>
<td>72 (42.9%)</td>
<td>13.424</td>
<td>0.001</td>
</tr>
</tbody>
</table>

Biology is the most popular Science subject in all schools, however this is more so in the Single-sex secondary schools. The Single-sex female schools have the highest uptake of the individual science subjects in the Transition Year; once again the provision of the subjects was a significant factor in this uptake (p < 0.001).

#### 5.2.3 Provision of Career-guidance in Transition Year schools

Research within the area of Science uptake and attitudes towards Science has shown that pupil’ perceptions of the subject and the potential careers within this area can have a major impact on whether or not they take the Science subjects throughout their school and further education (Kessels *et al.* 2006, Smyth and Hannan 2006). Therefore the provision and type of career guidance offered in Transition Year schools is of interest to this study. The schools’ provision of career-guidance teachers, the type of career-guidance offered the provision of information on careers in Science and the sources of this information are presented in this section.
5.2.3.1 Provision of a career-guidance teacher in Transition Year schools

There is a high level of provision of Career-guidance teachers in all types of schools, however, only pupils (n = 3) in Community and Comprehensive schools stated that they did not have a Career-guidance teacher in their school. Further Chi-square testing showed this to be a significant difference ($\chi^2 \ (2) = 14.577$, $p = 0.005$).

---

Figure 5.1: Provision of Career-guidance teacher by School type

<table>
<thead>
<tr>
<th>School Type</th>
<th>n</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Secondary School</td>
<td>162</td>
<td>100.0%</td>
</tr>
<tr>
<td>Vocational School</td>
<td>59</td>
<td>100.0%</td>
</tr>
<tr>
<td>Community and Comprehensive</td>
<td>43</td>
<td>93.5%</td>
</tr>
</tbody>
</table>
Once again, when the provision of Career-guidance teachers was broken down by the schools’ gender, a high level of provision was noted. 1.9% of pupils in Co-educational schools (n = 2) claimed that they did not have Career-guidance teachers in their school. Chi-square testing indicated that this was not a significant difference ($\chi^2 (2) = 1.967, p = 0.441$).

### 5.2.4 Type of Career-guidance offered

Pupils were offered many types of Career-guidance overall in their Transition Year. However there were differences exhibited when the type of Career-guidance offered was broken down by school type and gender. Figure 5.3 below indicates the type of Career-guidance offered to pupils in the various types of schools.
It is clear from Figure 5.3 that there are differences between the types of schools in the Career-guidance offered to the pupils. Chi-square tests were performed in order to establish the level of significance of these differences. Pupils in Secondary schools (n = 114, 67.9%) were offered aptitude testing as a form of Career-guidance more so than pupils in Vocational schools (n = 19, 31.7%) or Community and Comprehensive schools (n = 11, 22.4%). This was a significant difference ($\chi^2 (2) = 44.005, p = 0.000$). Vocational school pupils (n = 48, 80.0%) were offered a ‘chat about their career options. This was significantly different ($\chi^2 (2) = 7.756, p = 0.021$) to pupils in Secondary (n = 101, 60.1%) and Community and Comprehensive schools (n = 31, 63.3%). Vocational school pupils (n = 30, 50.0%) were also given more information regarding specific careers, when compared to Secondary (n = 65, 38.7%) and Community and Comprehensive school pupils (n = 17, 34.7%), though these differences were not significant ($\chi^2 (2) = 3.162, p = 0.206$) All school types had similar levels of Career-guidance in the form of a discussion about subject choice, though pupils in Vocational schools (n = 41, 68.3%) reported this slightly more than those in Secondary (n = 104, 61.9%) and Community and Comprehensive schools (n = 27, 55.1%), but these were not significant differences ($\chi^2 (2) = 2.013, p = 0.366$). This was also true for provision of information on specific courses, with pupils in
Vocational schools (n = 28, 46.7%) reporting slightly more provision, when compared to Secondary (n = 66, 39.3%) and Community and Comprehensive schools (n = 22, 44.9%). Once again these differences were not significant ($\chi^2 (2) = 1.213, p = 0.545$).

The author also sought to identify how helpful pupils found their Career-guidance sessions. Once exploratory analysis concluded that the data was non-normal, Kruskal-Wallis testing was conducted. There were significant differences in how helpful the pupils found the Career-guidance sessions in their schools ($H (2) = 8.907, p = 0.012$). A higher percentage (n = 35, 62.5%) of pupils in Vocational schools ($Mdn = 2.00$) agreed or strongly agreed that their Career-guidance sessions helped them make their subject choices for senior cycle. This did not compare favourably with pupils in Secondary schools ($Mdn = 3.00$), where 47.1% of pupils (n = 73) felt that their Career-guidance sessions were helpful. 50.0% of pupils (n = 22) in Community and Comprehensive schools ($Mdn = 2.50$) found their Career-guidance sessions helpful.

![Figure 5.4: Breakdown of Career-guidance offered by school gender.](image)

As Figure 5.4 illustrates there were differences in the types of Career-guidance offered to pupils depending on the gender intake of the schools. Once again Chi-square tests were performed to compare these differences. A greater proportion of pupils in Single-sex female (n = 56, 75.7%) and Single-sex male (n = 23, 69.7%) schools reported receiving an aptitude test, compared to those in Co-educational...
This was a significant difference ($\chi^2 (2) = 33.663, p = 0.000$). While a greater proportion of pupils in Single-sex female schools (n = 52, 70.3%) also had a chat about career options, pupils in Single-sex male schools did not (n = 15, 45.5%). Pupils in Co-educational schools (n = 113, 66.5%) also experienced this to a greater extent than the pupils in Single-sex male schools. These differences were considered significant ($\chi^2 (2) = 6.605, p = 0.037$). Single-sex female (n = 33, 46.6%) and Co-educational (n = 71, 41.8%) schools’ pupils received more information about specific careers than pupils in Single-sex male schools (n = 8, 24.2%). While considerable, these differences were not significant ($\chi^2 (2) = 4.249, p = 0.119$). Pupils in all schools received similar Career-guidance in the discussion of their future subject choices, with pupils in Single-sex female schools (n = 50, 67.6%) receiving slightly more than pupils in Single-sex male (n = 20, 60.6%) and Co-educational (n = 102, 60.0%) schools. None of these differences were significant ($\chi^2 (2) = 1.290, p = 0.525$). Once again all pupils had similar Career-guidance in receiving information on specific courses. Pupils in Co-educational schools (n = 75, 44.1%) received slightly more information in this area, than pupils in Single-sex female (n = 28, 37.8%) or male (n = 13, 39.4%) schools, but these were not significant differences ($\chi^2 (2) = 0.930, p = 0.628$).

Once again, exploration of the pupils’ level of satisfaction with the helpfulness of their Career-guidance sessions indicated that the data was not parametric, thus Kruskal-Wallis testing was performed in order to compare the medians of the pupils in the schools with different gender intakes. Significant differences (H(2)=12.925, p=0.002) were found in the pupils level of satisfaction with their Career-guidance sessions, when compared across the school genders. 50.0% of pupils (n = 14) in Single-sex male schools strongly agreed or agreed ($Mdn = 2.50$) that the Career-guidance sessions that they had were helpful to them for making their subject choice for senior cycle. 36.6% of pupils (n = 26, $Mdn = 3.00$) in Single-sex female schools found this to be the case, and 57.7% of pupils (n = 90, $Mdn = 2.00$) in Co-educational schools agreed or strongly agreed that these sessions were helpful.
5.2.4.1 Career-guidance – information on careers in Science

This sub-section examines the level of information the pupils’ in the various school types and genders had on careers in Science. The source of information for the pupils is also compared across the school types and genders.

Chi-square testing indicated that there were significant differences in the provision of information on careers in Science when examined by school type ($\chi^2 (2) = 22.479, p = 0.000$). Figure 5.5 illustrates there was far greater provision of information on careers in Science in Secondary (n = 106, 66.3%) and Vocational Schools (n = 40, 69.0%) when compared to Community and Comprehensive schools (n = 14, 29.8%).
As Figure 5.6 indicates there were also considerable differences among the pupils, depending on the gender intake of their school, when provision of information on careers in Science was examined. Chi-square tests indicated that these differences were significant ($\chi^2 (2) = 14.094, p = 0.001$). Pupils in the Single-sex female (n = 56, 77.8%) and male schools (n = 21, 63.6%) had a higher provision of information on careers in Science when compared with those in Co-educational schools (n = 83, 51.9%).

5.2.4.2 Sources of information on careers in Science

Pupils in all school types and genders received their information on careers in Science from a variety of different sources. This is illustrated in Figures 5.7 and 5.8.
Figure 5.7 indicates that there were differences in where pupils sourced their information on careers in Science among the different types of schools. Chi-square tests were performed on the data, in order to establish the levels of significance in the pupils’ sources of information among the types of schools. The majority of pupils received their information from their Science teachers, though a higher proportion of pupils in Vocational schools (n = 37, 61.7%) received the information from this source compared to pupils in Secondary schools (n = 82, 49.4%) and Community and Comprehensive schools (n = 23, 46.9%). These were not significant differences ($\chi^2 (2) = 3.183, p = 0.204$). Pupils in Vocational schools (n = 33, 55.0%) also received information on careers in Science from their Career-guidance teacher. The proportion of pupils in Secondary (n = 60, 35.7%) and Community and Comprehensive schools (n = 17, 34.7%) who received their information from this source was not as high, and this was a significant difference ($\chi^2 (2) = 7.494, p = 0.024$). A higher proportion of Vocational school pupils (n = 9, 15.0%) received information on careers in Science from open days, when compared to pupils in Secondary (n = 10, 6.0%) and Community and Comprehensive schools (n = 3, 6.1%), these differences were not significant ($\chi^2 (2) = 5.219, p = 0.078$). More pupils in Secondary (n = 19, 11.3%) had
their parents as source of information on careers in Science, compared to pupils in Vocational (n = 2, 3.3%) and Community and Comprehensive (n = 3, 6.1%) schools. Once again these differences were slight, and thus were not significant ($\chi^2 (2) = 4.040, p = 0.135$). Interestingly, a far greater proportion of Secondary school pupils received information on careers in Science from a visitor to their school (n = 44, 26.2%). Few pupils in Vocational (n = 6, 10.0%) and Community and Comprehensive schools (n = 3, 6.1%) received information on careers in Science this way, and therefore the differences between these groups was considered significant ($\chi^2 (2) = 14.003, p = 0.001$).

Figure 5.8 below examines the breakdown of pupils’ sources of information regarding careers in Science by their gender intake of their school.

Chi-square tests were performed in order to establish whether the differences in sources of information on careers in Science among the pupils compared with their schools gender intake were the same within reasonable bounds. A significantly higher proportion of pupils ($\chi^2 (2) = 10.683, p = 0.005$) in Single-sex female schools (n = 48, 65.8%) sourced their information on careers in Science from their Science teacher compared to the other two groups. Pupils in Single-sex male (n = 11, 33.3%) and Co-educational (n = 83, 41.9%) schools did not receive their information from this source to the same extent. However, significantly more pupils ($\chi^2 (2) = 8.794, p = 0.012$) in Single-sex male (n = 13, 39.4%) and Co-educational (n = 78, 45.9%) schools received
their information on careers in Science from their schools Career-guidance teacher, compared to pupils in Single-sex female schools (n = 19, 25.7%). More pupils in Single-sex male schools (n = 5, 15.2%) received information from open days than pupils in Single-sex female schools (n = 3, 4.1%) and Co-educational (n = 14, 8.2%) schools. These differences were not significant ($\chi^2 (2) = 3.896$, $p = 0.148$). However, significant differences were experienced ($\chi^2 (2) = 9.342$, $p = 0.009$) when pupils who received information from their parents were broken down by their schools gender intake. A greater percentage of pupils in Single-sex male (n = 6, 18.2%) and Single-sex female (n = 10, 13.5%) schools received information on careers in Science from their parents, compared to the pupils in Co-educational schools (n = 8, 4.7%). Highly significant differences ($\chi^2 (2) = 86.750$, $p = 0.000$) were also noted between the pupils in the different school gender intakes who received information on careers in Science from a visitor to their school. No pupils in Single-sex male schools received information from this source, whereas pupils in Co-educational schools (n = 12, 7.1%) and Single-sex female schools (n = 41, 55.4%) received information from this source to a significantly greater extent.

5.2.5 Provision of Science subjects in Transition Year schools at senior cycle.

The primary purpose of this sub-section is to examine how the Science subjects are provided, among the various school types and genders, in the Transition Year. The results presented indicate whether Science subjects were available at senior cycle and whether or not pupils planned to take these subjects. This has been broken down into examining the school types and the school genders, as indicated in Tables 5.6 and 5.7. The numbers of pupils who responded in each subject area are given in the first column of both tables.
Table 5.6: Science subject’s pupils plan to take for their Leaving Certificate by school type.

<table>
<thead>
<tr>
<th>Subject</th>
<th>Secondary School</th>
<th>Vocational School</th>
<th>Community and Comprehensive School</th>
<th>( \chi^2 )</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physics (n = 255)</td>
<td>16.1</td>
<td>61.3</td>
<td>22.6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chemistry (n = 254)</td>
<td>20.4</td>
<td>60.5</td>
<td>19.1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Biology (n = 258)</td>
<td>79.9</td>
<td>20.1</td>
<td>0.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Agricultural Science (n = 253)</td>
<td>12.7</td>
<td>28.7</td>
<td>58.6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physics &amp; Chemistry (n = 255)</td>
<td>0.0</td>
<td>7.0</td>
<td>93.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mathematics (n = 248)</td>
<td>100</td>
<td>0.0</td>
<td>0.0</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 5.6 clearly indicates that there is unequal provision of Science subjects at Leaving Certificate for pupils, depending on what type of school they are in. Chi-square tests indicated that these were significant differences compared across the types of schools. Physics is not offered in Secondary schools for over a quarter of pupils, yet a higher proportion of pupils in Vocational and Secondary schools plan to take the subject for their Leaving Certificate. Similarly nearly a quarter of the Secondary school pupils planned to take Chemistry for their Leaving Certificate and these figures are far greater than the current national averages (Childs 2010a). Table 5.7 clearly shows that Biology was the only Science subject to be provided uniformly across all school types. A significant finding was that Secondary school pupils claimed to have the lowest level of provision of Agricultural Science. No pupils planned to take the combined subject of Physics & Chemistry for their Leaving Certificate.
### Table 5.7: Science subjects pupils plan to take for their Leaving Certificate by school gender.

<table>
<thead>
<tr>
<th>Subject</th>
<th>Single-sex Male School</th>
<th></th>
<th>Single-sex Female School</th>
<th></th>
<th>Co-educational School</th>
<th></th>
<th>$\chi^2$</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes %</td>
<td>No %</td>
<td>Not Offered %</td>
<td>Yes %</td>
<td>No %</td>
<td>Not Offered %</td>
<td>Yes %</td>
<td>No %</td>
</tr>
<tr>
<td>Physics (n = 255)</td>
<td>15.2</td>
<td>84.8</td>
<td>0.0</td>
<td>14.5</td>
<td>66.7</td>
<td>18.8</td>
<td>20.3</td>
<td>64.1</td>
</tr>
<tr>
<td>Chemistry (n = 254)</td>
<td>24.2</td>
<td>75.8</td>
<td>0.0</td>
<td>31.0</td>
<td>67.6</td>
<td>1.4</td>
<td>10.0</td>
<td>68.7</td>
</tr>
<tr>
<td>Biology (n = 258)</td>
<td>87.9</td>
<td>12.1</td>
<td>0.0</td>
<td>77.5</td>
<td>22.5</td>
<td>0.0</td>
<td>68.2</td>
<td>31.8</td>
</tr>
<tr>
<td>Agricultural Science (n = 253)</td>
<td>43.8</td>
<td>56.3</td>
<td>0.0</td>
<td>5.6</td>
<td>14.1</td>
<td>80.3</td>
<td>8.0</td>
<td>52.7</td>
</tr>
<tr>
<td>Physics &amp; Chemistry (n = 255)</td>
<td>0.0</td>
<td>0.0</td>
<td>100.0</td>
<td>0.0</td>
<td>2.8</td>
<td>97.2</td>
<td>0.0</td>
<td>7.9</td>
</tr>
<tr>
<td>Mathematics (n = 248)</td>
<td>100</td>
<td>0</td>
<td>0</td>
<td>100</td>
<td>0</td>
<td>0</td>
<td>100</td>
<td>0</td>
</tr>
</tbody>
</table>
Chi-square testing has indicated that there are significant disparities between both the school type and the schools gender intake in whether or not the various Science subjects are provided at Leaving Certificate level. A significantly greater proportion of secondary schools do not offer the physical science subjects at Leaving Certificate level. All school types and genders offered Biology at Leaving Certificate level, however it was taken up more so in Secondary schools. The numbers of pupils planning on taking Agricultural Science or Physics & Chemistry were low, and there were significant differences in the schools who did not offer Agricultural Science, with Secondary schools having the poorest provision of the subject. Physics & Chemistry had equally poor provision in all school types.

Significant differences were also exhibited in Leaving Certificate subject provision and up-take between the school genders. All of the individual Science subjects, excluding Physics & Chemistry were offered in the single-sex male schools. This differed greatly when compared to the single-sex female and co-educational schools, which had lower provisions of Physics, Chemistry and Agricultural Science. Biology was offered in all schools.

5.2.6 Summary of section

Science subjects are not offered uniformly to pupils in the Transition Year, when compared across school types and genders. As a direct result of this pupils do not experience Science subjects equally in their Transition Year.

The level of career guidance provided also differs from school type and school gender, while there is a high level of provision of Career-guidance; a few pupils claim not to have a Career-guidance teacher in their school. There are significant differences across the type of Career-guidance received by pupils in the various school types and genders, in both the type of Career-guidance they have received and in their sources of information on scientific careers. This may lead to pupils in certain schools having far less information with which to make their decision for their senior cycle subject choice and their future career.
5.2.7 Student questionnaire

5.2.7.1 Introduction and sample profile:

The results presented in this section of the chapter come from the third level student questionnaire that was administered to first year students in a general chemistry module. The author wished to gain a perspective into how the Transition Year and Science within the year were offered to these students while they were in their second level education. There were 400 students in this general chemistry module and 355 of these students responded to the questionnaire giving a response rate of 89.0%. Of the 355 respondents, 337 gave information about whether or not their school offered the Transition Year. However, it is possible that some of the students surveyed went to the same school, and schools may have been counted twice. This was not accounted for in the survey. 266 (78.9%) attended schools that offered the Transition Year and 71 (21.1%) attended schools which did not offer the year. 158 (44.5%) students took the Transition Year. These statistics are similar to the national data on Transition Year provision and take-up. The results in this section are presented under a number of headings: Who offers the Transition Year, Science in Transition Year Schools, CAO points achieved and Career-guidance in Transition Year schools.

5.2.7.2 Who offers the Transition Year?

The results presented in the Tables below indicate the type and gender of the schools that offered the Transition Year and the schools in which students took the year. The Transition Year was not offered in a number of schools: 266 schools did offer the year, but 72 did not. The breakdown of this can be seen in Table 5.8 below.
The percentage of schools offering the Transition Year was in line with national figures, with vocational schools having the lowest level of provision. Traditionally Examination preparation schools\(^7\) do not offer the Transition Year, the one student who has indicated that they did take it may have taken it in their school prior to joining the Examination preparation school. However, given the low number of students who came from an Examination preparation school these figures can be discounted as they are not statistically significant. When Chi-square comparisons examining the level of provision in the other school types (Secondary, Community and Comprehensive and Vocational schools) were conducted statistically significant findings were noted ($\chi^2(2) = 17.227, p = 0.000$).

\(^7\) Traditionally, in Ireland, these schools are referred to as ‘Grind schools’. The purpose of these schools is to prepare pupils for their Leaving Certificate Examination, in order to achieve the best possible grades. Teaching and Learning techniques in these schools typically involve a great deal of rote learning, and ‘teaching to the examination’.
Table 5.9: Breakdown of the students who took the Transition Year by school type.

<table>
<thead>
<tr>
<th>School Type</th>
<th>Did take the Transition Year</th>
<th>Did not take the Transition Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Secondary School (n = 196)</td>
<td>n: 106, %: 54.1</td>
<td>n: 90, %: 45.9</td>
</tr>
<tr>
<td>Community and Comprehensive School (n = 75)</td>
<td>n: 41, %: 54.7</td>
<td>n: 34, %: 45.3</td>
</tr>
<tr>
<td>Vocational School (n = 18)</td>
<td>n: 7, %: 38.9</td>
<td>n: 11, %: 61.1</td>
</tr>
<tr>
<td>Exam Preparation School (n = 2)</td>
<td>n: 1, %: 50</td>
<td></td>
</tr>
</tbody>
</table>

The highest proportion of students who took the Transition Year came from Community schools, where there is a high level of provision. The lowest level of provision of the year was in Vocational schools and this is reflected in the up-take of the year by students in these schools, but Chi-square testing confirmed that this was not a significant difference ($\chi^2(2) = 1.606$, $p = 0.448$).
Table 5.10: Breakdown of the schools who offered the Transition Year by school gender.

<table>
<thead>
<tr>
<th></th>
<th>Single-sex male school</th>
<th></th>
<th>Single-sex female school</th>
<th></th>
<th>Co-educational school</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
<td>n</td>
<td>%</td>
<td>n</td>
<td>%</td>
</tr>
<tr>
<td>Did offer the Transition Year</td>
<td>55</td>
<td>71.4</td>
<td>45</td>
<td>86.5</td>
<td>166</td>
<td>79.8</td>
</tr>
<tr>
<td>Did not offer the Transition Year</td>
<td>22</td>
<td>28.6</td>
<td>7</td>
<td>13.5</td>
<td>42</td>
<td>20.2</td>
</tr>
<tr>
<td>Schools who offer the Transition Year (National figures)</td>
<td>93</td>
<td>87.7</td>
<td>133</td>
<td>95.0</td>
<td>326</td>
<td>67.5</td>
</tr>
</tbody>
</table>

It is clear from Table 5.10 that a higher proportion of students in Single-sex female schools were offered the Transition Year, in comparison to their counterparts in Single-sex male and Co-educational schools. Chi-square testing concluded that there were no significant differences ($\chi^2 (2) = 4.512, p = 0.105$) when the gender of the schools who offered the Transition Year was examined.
A greater proportion of students in Single–sex female schools took the Transition Year, followed by students from Co-educational schools. This may be reflective of the provision of the Transition Year in these schools, with a higher proportion of students in Single-sex female schools, compared to Single-sex male and Co-educational schools taking the year. However, this was not a significant difference ($\chi^2 (2) = 2.978, p = 0.226$).

The results from this study are similar to those found by Smyth et al. (2004), in terms of second level schools’ provision of the Transition Year. The study by Smyth examines the provision of the Transition Year among second level schools. Similar to the work of Smyth et al. (2004) this research study found that Single–sex female schools have the highest provision of the Transition Year, followed by Co-educational schools, and finally the lowest provision was found to be in Single–sex male schools. These differences while noticeable were not considered significant.

### 5.2.7.3 Science in Transition Year Schools

The provision of Science subjects among the students who took the year is examined in this section. The following two Tables (Table 5.12 and Table 5.13) present the subjects that students sampled in their Transition Year by the type of school they attended, and the schools gender respectively. Chi-square tests were conducted to
examine the data for significant differences in the Science subjects sampled in the Transition Year among the school types.

<table>
<thead>
<tr>
<th>Subject</th>
<th>Secondary n (%)</th>
<th>Vocational n (%)</th>
<th>Community and comprehensive n (%)</th>
<th>$\chi^2$</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physics</td>
<td>68 (64.8%)</td>
<td>5 (71.4%)</td>
<td>22 (53.7%)</td>
<td>2.429</td>
<td>0.530</td>
</tr>
<tr>
<td>Chemistry</td>
<td>71 (67.0%)</td>
<td>5 (71.4%)</td>
<td>25 (62.5%)</td>
<td>0.870</td>
<td>0.884</td>
</tr>
<tr>
<td>Biology</td>
<td>73 (68.9%)</td>
<td>6 (85.7%)</td>
<td>31 (75.6%)</td>
<td>1.1796</td>
<td>0.641</td>
</tr>
<tr>
<td>Agricultural Science</td>
<td>12 (11.3%)</td>
<td>2 (28.6%)</td>
<td>12 (29.3%)</td>
<td>7.742</td>
<td>0.059</td>
</tr>
<tr>
<td>Physics &amp; Chemistry</td>
<td>6 (5.7%)</td>
<td>0 (0.0%)</td>
<td>3 (7.3%)</td>
<td>0.668</td>
<td>1.000</td>
</tr>
<tr>
<td>General Science taster</td>
<td>2 (1.9%)</td>
<td>0 (0.0%)</td>
<td>2 (5.0%)</td>
<td>1.302</td>
<td>0.521</td>
</tr>
</tbody>
</table>

Table 5.12 above illustrates that there were differences in the Science subjects sampled by students in their Transition Year, depending on the type of school they attended. In this sample Vocational schools had more students taking the traditional Science subjects in the Transition Year. However, none of these differences were significant. Vocational and Community and Comprehensive schools had a much greater uptake of Agricultural Science in the Transition Year. The majority of students who took the Transition Year sampled the individual Science subjects rather than a General Science taster.
Table 5.13: Transition Year Science subjects taken by school gender

<table>
<thead>
<tr>
<th>Subject</th>
<th>Single-sex male n (%)</th>
<th>Single-sex female n (%)</th>
<th>Co-educational n (%)</th>
<th>$\chi^2$</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physics</td>
<td>27 (71.1%)</td>
<td>19 (63.3%)</td>
<td>53 (59.6)</td>
<td>1.514</td>
<td>0.469</td>
</tr>
<tr>
<td>Chemistry</td>
<td>26 (68.4%)</td>
<td>23 (74.2%)</td>
<td>56 (63.6%)</td>
<td>1.207</td>
<td>0.547</td>
</tr>
<tr>
<td>Biology</td>
<td>25 (65.8%)</td>
<td>23 (74.2%)</td>
<td>66 (74.2%)</td>
<td>1.008</td>
<td>0.604</td>
</tr>
<tr>
<td>Agricultural Science</td>
<td>2 (5.3%)</td>
<td>2 (6.5%)</td>
<td>23 (25.8%)</td>
<td>11.040</td>
<td>0.004</td>
</tr>
<tr>
<td>Physics &amp; Chemistry</td>
<td>3 (7.9%)</td>
<td>3 (9.7%)</td>
<td>3 (3.4%)</td>
<td>2.153</td>
<td>0.404</td>
</tr>
<tr>
<td>General Science taster</td>
<td>1 (2.6%)</td>
<td>1 (3.2%)</td>
<td>2 (2.3%)</td>
<td>0.085</td>
<td>0.958</td>
</tr>
</tbody>
</table>

Once again Chi-square tests conducted on the data indicated that there were differences between the subjects sampled by the students in their Transition Year, when compared with the schools’ gender intakes. A higher proportion of Single-sex male schools offered Physics in the Transition year. This trend was seen with Single-sex female schools for Chemistry and both the Single-sex female and Co-educational schools exhibited this for Biology. There were no significant differences in these three subjects. Agricultural Science did exhibit a significant difference in the proportion of students taking it among the schools in the Transition Year. Significantly more students in Co-educational schools took the year when compared with the Single-sex schools.
Table 5.14: Leaving Certificate Science subjects taken

<table>
<thead>
<tr>
<th></th>
<th>Secondary n (%)</th>
<th>Vocational n (%)</th>
<th>Community and comprehensive n (%)</th>
<th>( \chi^2 )</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physics</td>
<td>39 (36.8%)</td>
<td>2 (28.6%)</td>
<td>6 (14.6%)</td>
<td>6.859</td>
<td>0.029</td>
</tr>
<tr>
<td>Chemistry</td>
<td>39 (36.8%)</td>
<td>1 (14.3%)</td>
<td>16 (39.0%)</td>
<td>1.608</td>
<td>0.476</td>
</tr>
<tr>
<td>Biology</td>
<td>70 (66.0%)</td>
<td>3 (42.9%)</td>
<td>28 (68.3%)</td>
<td>1.745</td>
<td>0.398</td>
</tr>
<tr>
<td>Agricultural Science</td>
<td>23 (21.7%)</td>
<td>0 (0.0%)</td>
<td>13 (31.7%)</td>
<td>3.891</td>
<td>0.155</td>
</tr>
<tr>
<td>Physics &amp; Chemistry</td>
<td>2 (1.9%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0.918</td>
<td>0.631</td>
</tr>
<tr>
<td>Mathematics</td>
<td>106 (100.0%)</td>
<td>7 (100.0%)</td>
<td>40 (97.6%)</td>
<td>2.774</td>
<td>0.312</td>
</tr>
</tbody>
</table>

Table 5.15: CAO points achieved

<table>
<thead>
<tr>
<th></th>
<th>Single-sex male n (%)</th>
<th>Single-sex female n (%)</th>
<th>Co-educational n (%)</th>
<th>( \chi^2 )</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physics</td>
<td>17 (44.7%)</td>
<td>8 (25.8%)</td>
<td>23 (25.8%)</td>
<td>4.876</td>
<td>0.087</td>
</tr>
<tr>
<td>Chemistry</td>
<td>10 (26.3%)</td>
<td>18 (58.1%)</td>
<td>30 (33.7%)</td>
<td>8.197</td>
<td>0.017</td>
</tr>
<tr>
<td>Biology</td>
<td>20 (52.6%)</td>
<td>30 (92.8%)</td>
<td>54 (60.7%)</td>
<td>17.189</td>
<td>0.000</td>
</tr>
<tr>
<td>Agricultural Science</td>
<td>8 (21.1%)</td>
<td>3 (9.7%)</td>
<td>26 (29.2%)</td>
<td>5.049</td>
<td>0.080</td>
</tr>
<tr>
<td>Physics &amp; Chemistry</td>
<td>0 (0.0%)</td>
<td>1 (3.2%)</td>
<td>1 (1.1%)</td>
<td>1.454</td>
<td>0.727</td>
</tr>
<tr>
<td>Mathematics</td>
<td>38 (100.0%)</td>
<td>31 (100.0%)</td>
<td>88 (98.9%)</td>
<td>0.780</td>
<td>1.000</td>
</tr>
</tbody>
</table>
5.2.7.4 CAO points achieved

The author was interested in the differences in the CAO points achieved by students in the schools they attended when compared with the schools type and gender intake. The schools provision of the Transition Year was also examined with the CAO points achieved by the students. Tables 5.16 illustrate the differences among the schools.
Table 5.16: CAO points achieved by students by whether their school offered the Transition Year.

<table>
<thead>
<tr>
<th>Subject</th>
<th>School offered the Transition Year (median CAO points)</th>
<th>School did not offer the Transition Year (median CAO points)</th>
<th>U</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mathematics (n = 326)</td>
<td>55.0</td>
<td>55.0</td>
<td>8550.5</td>
<td>0.648</td>
</tr>
<tr>
<td>Physics (n = 97)</td>
<td>80.0</td>
<td>70.0</td>
<td>591.0</td>
<td>0.068</td>
</tr>
<tr>
<td>Chemistry (n = 123)</td>
<td>80.0</td>
<td>75.0</td>
<td>953.0</td>
<td>0.054</td>
</tr>
<tr>
<td>Biology (n = 198)</td>
<td>85.0</td>
<td>80.0</td>
<td>2354.5</td>
<td>0.419</td>
</tr>
<tr>
<td>Agricultural Science (n = 75)</td>
<td>80.0</td>
<td>80.0</td>
<td>355.5</td>
<td>0.325</td>
</tr>
<tr>
<td>Physics &amp; Chemistry (n = 3)</td>
<td>77.5</td>
<td>0</td>
<td>0.000</td>
<td>0.667</td>
</tr>
<tr>
<td>Total (excluding Physics &amp; Chemistry points)</td>
<td><strong>380.0</strong></td>
<td><strong>360.0</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td><strong>457.5</strong></td>
<td><strong>360.0</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The results presented in Table 5.16 were prepared by initially checking the data for normality. The data was non-parametric, and therefore median values for CAO points were used. Mann-Whitney tests were conducted. While students in schools that offered the Transition Year clearly achieved higher CAO points than their counterparts in schools that did not offer the year, but these differences between the subjects were not deemed to be significant.
### Table 5.17: CAO points achieved in Leaving Certificate Science subjects by school type (median values)

<table>
<thead>
<tr>
<th>Subject</th>
<th>Secondary School</th>
<th>Community &amp; Comprehensive School</th>
<th>Vocational School</th>
<th>Exam Preparation School (not included in statistical tests)</th>
<th>H(2)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mathematics</td>
<td>60.0</td>
<td>55.0</td>
<td>45.0</td>
<td>35.0</td>
<td>F(2) = 0.658</td>
<td>0.519</td>
</tr>
<tr>
<td>Physics</td>
<td>80.0</td>
<td>77.5</td>
<td>100.0</td>
<td>n/a</td>
<td>1.998</td>
<td>0.376</td>
</tr>
<tr>
<td>Chemistry</td>
<td>75.0</td>
<td>82.5</td>
<td>40.0</td>
<td>n/a</td>
<td>0.551</td>
<td>0.759</td>
</tr>
<tr>
<td>Biology</td>
<td>85.0</td>
<td>85.0</td>
<td>75.0</td>
<td>100.0</td>
<td>2.645</td>
<td>0.226</td>
</tr>
<tr>
<td>Agricultural Science</td>
<td>75.0</td>
<td>n/a</td>
<td>n/a</td>
<td>100.0</td>
<td>1.317</td>
<td>0.539</td>
</tr>
<tr>
<td>Physics &amp; Chemistry</td>
<td>75.0</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>Total</td>
<td>450.0</td>
<td>385.0</td>
<td>260.0</td>
<td>235.0</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The CAO points were checked for normality by examining histograms visually and skewness and kurtosis values, however, the data was found to be non-parametric, and therefore Kruskal-Wallis tests were conducted to compare the differences in CAO points among the school types. Median values of CAO points were reported due to the non-parametric nature of the data. It is clear that Secondary schools students scored the highest number of CAO points over all. When this is broken down per subject area it is clear that in Mathematics students from secondary schools achieved the highest number of CAO points. Students from secondary schools also scored the best in Physics, and were the highest achievers for Chemistry. While, the examination preparation school scored the highest for both Biology and Agricultural Science this may be discounted statistically as the numbers involved are too few. Therefore in Biology Community and Comprehensive schools achieved the highest CAO points. The effect of the schools’ gender on students’ CAO points was also of interest, which is illustrated in Table 5.18 below. While there are differences in CAO points between the schools for all subjects, none of these were considered to be significant (p > 0.05).
Table 5.18: CAO points achieved in Leaving Certificate Science subjects by school gender (median values)

<table>
<thead>
<tr>
<th>Subject</th>
<th>Single-sex Male</th>
<th>Single-sex Female</th>
<th>Co-educational</th>
<th>H(2)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mathematics</td>
<td>60.0</td>
<td>60.0</td>
<td>50.0</td>
<td>F(2) = 2.394</td>
<td>0.095</td>
</tr>
<tr>
<td>Physics</td>
<td>80.0</td>
<td>77.5</td>
<td>77.5</td>
<td>1.998</td>
<td>0.376</td>
</tr>
<tr>
<td>Chemistry</td>
<td>80.0</td>
<td>75.0</td>
<td>80.0</td>
<td>0.551</td>
<td>0.759</td>
</tr>
<tr>
<td>Biology</td>
<td>85.0</td>
<td>85.0</td>
<td>80.0</td>
<td>2.645</td>
<td>0.226</td>
</tr>
<tr>
<td>Agricultural Science</td>
<td>75.0</td>
<td>90.0</td>
<td>80.0</td>
<td>1.317</td>
<td>0.539</td>
</tr>
<tr>
<td>Physics &amp; Chemistry</td>
<td>n/a</td>
<td>75.0</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>Total (not including Physics &amp; Chemistry points)</td>
<td>380.0</td>
<td>387.5</td>
<td>380.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>380.0</td>
<td>462.5</td>
<td>367.5</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Once again the data was checked for normality, and this was not found, other than in Mathematics. Due to the non-parametric nature of the data, median values were reported in Table 5.18. The CAO points for the Science subjects, which was non-parametric, was tested using the Kruskal-Wallis test, and no significant differences were found. The parametric data (Mathematics) was compared among the schools gender intakes using a one-way ANOVA, and non-significant differences were found. Table 5.18 illustrates that students in Single-sex male schools performed better than students in Single-sex female and Co-educational schools in both Physics and Biology, but the students in the Single-sex female schools outperformed the males in Mathematics, Chemistry and Agricultural Science. None of these differences were considered to be significant.

5.2.7.5 Career Guidance in Transition Year Schools

The following results aim to present a picture of the levels and provision of career-guidance in Transition Year schools, while also examining the differences between schools that do not offer the Year, compared to those that do.

Provision of career guidance in schools that offer the Transition Year

Table 5.19 below indicates that there is a high level of Career-guidance provision in all schools, though this is slightly higher for schools that offer the Transition Year, compared to those that do not offer the year. Chi-square testing was performed and this difference was significant ($\chi^2 (1) = 21.644$, p = 0.000) with schools that did not offer the Transition Year exhibiting a greater proportion of no career-guidance offered to pupils.
Table 5.19: Provision of Career-guidance by whether schools offer the Transition Year.

<table>
<thead>
<tr>
<th></th>
<th>School offers the Transition Year</th>
<th>School does not offer the Transition Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Career guidance offered</td>
<td>246 (99.2%)</td>
<td>58 (87.9%)</td>
</tr>
<tr>
<td>No career guidance offered</td>
<td>2 (0.8%)</td>
<td>8 (12.1%)</td>
</tr>
</tbody>
</table>

100.0% of schools whose pupils took the Transition Year had career guidance teachers. There is a good level of provision of career guidance among the schools, with very few offering no guidance whatsoever. The same can be said of schools where school gender intake and whether the school offers the Transition Year Programme is examined against the provision of career guidance teachers. Few schools do not offer any career guidance.

Table 5.20: The provision of career guidance by school type.

<table>
<thead>
<tr>
<th></th>
<th>Secondary school (n = 205)</th>
<th>Community and Comprehensive school (n = 82)</th>
<th>Vocational school (n = 25)</th>
<th>Exam Preparation school (n = 2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Career guidance offered</td>
<td>n</td>
<td>%</td>
<td>n</td>
<td>%</td>
</tr>
<tr>
<td></td>
<td>196</td>
<td>95.6%</td>
<td>81</td>
<td>98.8%</td>
</tr>
<tr>
<td>No career guidance offered</td>
<td>9</td>
<td>4.4%</td>
<td>1</td>
<td>1.2%</td>
</tr>
</tbody>
</table>

There is a good level of provision of career guidance among the schools, with very few offering no guidance whatsoever.
Table 5.21: The provision of career guidance by school gender

<table>
<thead>
<tr>
<th></th>
<th>Single-sex male school</th>
<th>Single-sex female school</th>
<th>Co-educational school</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Career guidance offered</strong></td>
<td>n</td>
<td>%</td>
<td>n</td>
</tr>
<tr>
<td></td>
<td>63</td>
<td>94.0%</td>
<td>47</td>
</tr>
<tr>
<td><strong>No career guidance offered</strong></td>
<td>4</td>
<td>6.0%</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>196</td>
<td>96.6%</td>
<td></td>
</tr>
</tbody>
</table>

The same can be said of schools where school gender and whether the school offers the Transition Year Programme is examined against the provision of career guidance teachers. Few schools do not offer any career guidance.

**Type of career guidance offered:**

![Figure 5.9: Type of Career-guidance experienced by students in types of Transition Year schools](image)

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The various school types differed in how they offered Career-guidance. Chi-square testing was conducted to compare the differences among the school types. The majority of students across all types of schools received an aptitude test during their Career-guidance sessions. Slightly more students (n = 78, 73.6%) in Secondary schools compared with students in Vocational (n = 5, 71.4%) and Community and Comprehensive schools (n = 30, 73.2%) received aptitude testing, but these differences were not significant ($\chi^2 (2) = 0.017, \ p = 1.000$). Similar results for Career-guidance sessions involving a chat about career-options were experienced among students when compared across school types, with no significant differences experienced ($\chi^2 (2) = 2.946, \ p = 0.276$). 100.0% of students (n = 7) in Vocational schools received this type of Career-guidance, compared with 70.7% of students (n = 29) in Community and Comprehensive and 69.8% of students (n = 74) in Secondary schools. A higher proportion of students (n = 56, 52.8%) received information about specific careers in Secondary schools, when examined alongside Community and Comprehensive (n = 20, 48.8%) and Vocational schools (n = 2, 28.6%). None of these differences were considered significant ($\chi^2 (2) = 1.624, \ p = 0.458$). Similarly to the pupils surveyed a high proportion of students (n = 5, 71.4%) who had attended Vocational schools had a discussion about their senior cycle subject choice in their Transition Year Career-guidance sessions. These high numbers were not reflected across the school types with students (n = 46, 43.8%) from Secondary schools and Community and Comprehensive schools (n = 17, 41.5%) not receiving this type of Career-guidance to the same extent. However, these differences were not considered significant ($\chi^2 (2) = 2.229, \ p = 0.373$), particularly due to the small sample from Vocational schools. Nearly all students (Secondary (n = 55, 51.9%), Community and Comprehensive (n = 23, 56.1%) Vocational (n =4, 57.1%)) received the same extent of information about specific courses in their Career-guidance sessions, and therefore there were no significant differences between these groups ($\chi^2 (2) = 0.916, \ p = 0.255$).
As Figure 5.10 illustrates there were also differences in the type of Career-guidance students experienced between the school genders. Chi-square testing was conducted in order to verify whether the differences noted were significant. Students who attended Single-sex female schools (n = 25, 80.6%) received more aptitude testing compared to students in Single-sex male (n = 25, 65.8%) and Co-educational (n = 66, 74.2%) schools. These were not significant differences ($\chi^2 (2) = 1.998, p = 0.370$). A higher proportion of students (n = 23, 74.2%) in Single-sex female schools also received a chat about their career options, compared to students in Single-sex male (n = 25, 65.8%) and Co-educational (n = 64, 71.9%) schools. Once again, these were not significant differences ($\chi^2 (2) = 0.688, p = 0.709$). This trend continued when examining whether students received information regarding specific careers, with 61.3% (n = 19) of students in Single-sex female schools receiving this information, compared to 50.6% of students in Co-educational (n = 45) and 42.1% of students (n = 16) in Single-sex male schools. None of these differences were considered significant ($\chi^2 (2) = 2.514, p = 0.284$).

When discussion of subject choice was examined the trend changed in the direction of students who had attended Single-sex male schools, with 50.0% of these students (n = 19) experiencing a discussion about subject choice in their Transition Year Career-guidance.
sessions. 44.9% of students (n = 40) in Co-educational schools experienced this type of Career-guidance, while only 36.7% of students (n = 11) in Single-sex female schools did. These differences were not large enough to be considered significant ($\chi^2 (2) = 1.217, p = 0.544$). Students were almost equal in the level of information that they received on specific courses, and no significant differences were found between the groups ($\chi^2 (2) = 0.137, p = 0.934$). 52.6% of students (n = 20) in Single-sex male schools, 51.6% of students (n = 16) in Single-sex female schools and 55.1% of students (n = 49) in Co-educational schools received this type of Career-guidance in their Transition Year.

5.2.8 Summary

The type of schools that the students attended are comparable to the national averages (Smyth and Hannan 2002). The gender intakes of the schools that the students attended are less in accordance with the national averages. However, this is not a representative sample of pupils nationally as respondents were from a first year undergraduate Chemistry module, and it is expected that a higher proportion of students taking Science come from Single-sex male or Co-educational schools, as these typically have a better provision and culture of Science (Smyth 2004). However, in line with the national figures the trend for the provision of Transition Year to be greater among Single-sex female schools, Secondary schools and Community and Comprehensive schools still stands in this sample. There are differences in how Transition Year Science is offered among different school types and genders, with students who attended Vocational and Secondary schools experiencing a greater provision of the Physical Sciences and Vocational schools and Community and Comprehensive schools offering more Biology and Agricultural Science. The students in the Single-sex schools experienced more of the Physical Sciences in their Transition Year. Single-sex female schools and Co-educational schools had more Biology and Agricultural Science students. Students who attended schools that offered the Transition Year achieved higher CAO points than those who did not attend schools which offered the Transition Year. Of the students who took the Transition Year, those in Secondary schools and Single-sex female schools achieved the highest CAO points in Mathematics and Science subjects. A significantly greater number of schools offering the Transition Year also offer Career-guidance, when compared to those schools who do not offer the Transition Year. The highest provision of Career-guidance for students was in Community and Comprehensive schools and Single-sex female schools.
5.3 Teachers’ Section

This section of the chapter brings together the results from both of the teacher questionnaires, in Phase 1 and Phase 2, in order to gain an insight into how the Transition Year, and Science within the year is organised in schools. The results are presented in two parts; the initial section uses the results from the Teacher questionnaire carried out in Phase 1 to examine the Transition Year and Transition Year Science. The second section does this also, but utilising the results from the Teacher questionnaire carried out in Phase 2 of the study.

5.3.1 Teacher questionnaire (1)

5.3.1.1 Introduction

The results from this teacher questionnaire are presented under two headings: the general profile of the schools, and Science in the Transition Year. 88 (17.1%) teachers responded to this questionnaire, out of a potential 514.

5.3.1.2 General Profile of the schools

Figures 5.11 and 5.12 illustrate the type of schools in the sample and the gender of the schools respectively.
Figure 5.11: Breakdown of the teacher questionnaire schools by school type.

The majority of the cohort were teaching in Secondary schools (n = 60), with 14 teachers in Vocational schools, and 14 in Community and Comprehensive schools.
The majority of the sample were also teaching in Co-educational schools (n = 49), followed by Single-sex female schools (n = 27). Single-sex male schools (n = 12) only made up 13.6% of the sample.
Figure 5.13 indicates that the majority of schools (n = 40, 60.6%) took up the Transition Year between 1990 and 2000, when it came out of its pilot phase and became available to all schools. Some schools have had the programme since the pilot phase in the 1970’s (n = 5) and others took it up during the expansion period in the 1980’s (n = 6). Many schools have only opted to offer Transition Year in recent years, with 17.1% (n = 15) of schools taking up the programme since 2000. These figures are not available nationally and as such cannot be compared to these findings.

Chi-square tests showed that there were no significant differences ($\chi^2(6) = 2.063, p = 0.942$) between the school types when compared. This was also true when the schools gender was examined for significant differences in the year that the Transition Year was taken up ($\chi^2(6) = 5.201, p = 0.537$). As such it can be concluded that the year that schools chose to initially take-up the Transition Year was not related to the type of school or schools’ gender intake.

77.3% teachers (n = 68) surveyed noted that their school chose to make Transition Year a compulsory year, however, 22.7% (n = 20) have not. For those schools in which Transition Year isn’t compulsory, students have an option on whether or not to choose it.
Once again Chi-square testing was conducted and when school type ($\chi^2 (2) = 0.758, p = 0.803$) and school gender ($\chi^2 (2) = 0.041, p = 1.000$) were compared for significant differences in whether the Transition Year was compulsory of not, none were found.

Figure 5.14 illustrates that of the schools who responded to this question, it appears that the number of pupils from the previous Junior Certificate Year opting to take the Transition Year varies widely. The most common percentages were between 20-30% and 90-100%, giving two very different ends of the spectrum. However, similarly to the national average (46.7%) for the school year 2006/07 the median of the sample was 50.0%.

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Figure 5.15 indicates that once again the most common percentages of pupils taking the Transition Year are 90-100%, 20-30% and 40-50%. The median value for this cohort was also 50.0%, in line with the national average of 47.1% for the school year 2007/08. The percentage of pupils doing Transition Year from the previous Junior Certificate Year did not correlate with the number of teachers who said that Transition Year was compulsory in their school. This leads to the belief that while Transition Year may be advertised as compulsory in some schools, pupils still have the option to take or leave it.

### 5.3.2 Science in the Transition Year

In order to obtain a clear and comprehensive picture of how Transition Year Science is both offered and organised this section has been broken down into two sub-parts. These sub-parts present the Science subjects that are offered in the teachers’ schools, and how they are offered.
5.3.2.1 Science subjects experienced in Transition Year

73.8% (n = 62) of teachers said that pupils in their schools would experience all three primary Science subjects (Physics, Chemistry, Biology). 26.2% (n = 22) stated that their pupils did not get to experience all of these three Science subjects in their schools’ Transition Year. Chi-square tests were performed and when both school type ($\chi^2 (2) = 1.223, p = 0.596$) and school gender ($\chi^2 (2) = 1.813, p = 0.442$) were examined for any significant differences in whether their pupils experienced all three primary Science subjects in Transition Year it was found that there were no significant differences.

Following on from these results it is worth noting what Science subjects are taught in Transition Year, in these schools (Figure 5.16).

![Figure 5.16: Science subjects taught in the Transition Year (teacher questionnaire Phase 1).](image)

The majority of schools are teaching Physics (n = 69, 78.4%), Chemistry (n = 72, 81.8%) and Biology (n = 76, 86.4%). Fewer schools are teaching Agricultural Science (n = 11, 12.5%) or Physics & Chemistry (n = 1, 1.1%) in the Transition Year and 20.5% of schools (n = 18) are teaching a combined General Science taster to their Transition Year Science pupils. When school type is taken into account there are no significant
differences between the Science subjects offered in the Transition Year. This is also true when school gender is examined.

Table 5.22 below offers a sample of qualitative responses from the teachers, regarding what Science subjects their pupils experience in their Transition Year.

Table 5.22: Science subjects that pupils do experience in TY Responses to Question 7, what Science subjects do students get to experience for Transition Year in your school? (n = 88)

<table>
<thead>
<tr>
<th>Question</th>
<th>Teachers’ Response</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>What Science subjects do pupils get to experience for Transition Year in your school?</strong></td>
<td>• “They have a choice of all 3 or any combination of them or none”</td>
</tr>
<tr>
<td></td>
<td>• “Physics, Chemistry, Biology”</td>
</tr>
<tr>
<td></td>
<td>• “2 of the 3 science subjects”</td>
</tr>
<tr>
<td></td>
<td>• “Physics, Chemistry, Biology”</td>
</tr>
<tr>
<td></td>
<td>• “Physics is a module (i.e. 2 doubles a week) ie six weeks rotation, Young Scientist was an option before Christmas – 2 class groups became Biology module after Christmas.”</td>
</tr>
<tr>
<td></td>
<td>• “This year, Physics – Electronics. It depends on the teacher who takes it”</td>
</tr>
<tr>
<td></td>
<td>• “Biology”</td>
</tr>
<tr>
<td></td>
<td>• “Could choose to experience all 3 but most take Biology only.”</td>
</tr>
<tr>
<td></td>
<td>• “Mostly Biology”</td>
</tr>
</tbody>
</table>

The responses from Transition Year Science teachers in Table 5.22 indicate the disparities in how Science is provided for pupils in the Transition Year. The teachers’ responses allow for a more in-depth picture of how pupils experience the science subjects on offer. Teachers were asked this free response question what Science subjects do pupils get to experience for Transition Year in your school? Of those subjects offered, 62.5% (n = 55) offered Biology, 52.3% (n = 46) offered Physics and 52.3% (n = 46) offered Chemistry. Other options such as Horticulture, Applied Maths, Food Safety, Forensics, Agricultural science, Technology, Medical Physics, Earth Science, Waste Management,
Engineering, Genetics, Astronomy, Rocket Science, Diseases and Investigative science were offered. One teacher noted that pupils could choose what science subject to take but nearly all pupils chose Biology. This was also true for other teachers, with one teacher noting that pupils could take all three or any other combination of them or none at all. Other schools offered either two of Physics, Chemistry or Biology depending on which teachers were timetabled. One teacher noted that this year they were only looking at Physics. These responses are a sample of the responses from teachers. The full list of responses is in Appendix H.

The author also wished to investigate how much time was allocated to Science in the Transition Year and how these class periods were grouped. These results are illustrated in Figure 5.17 below.

![Figure 5.17: Frequency of Transition Year science class periods per (n = 88)](image)

There is much variation in the number of class periods teachers have with their Transition Year Science classes per week. The most common way of organising Transition Year science on a weekly basis was to have 1 double (n = 19, 21.6%) or 1 single and 1 double per week (n = 21, 23.9%). Other ways of organising the week was to have 2 single periods and 1 double (n = 9, 10.2%), to have 2 doubles (n = 11, 12.5%) or to have 3
singles (n = 6, 6.82%). Some schools were particularly enthusiastic having 6 singles and 5 doubles per week (1.14%), others only had one single class per week (1.14%). Chi-square testing confirmed that there were no significant differences in this allocation of class time when compared across school type ($\chi^2 (28) = 36.519, p = 0.130$) and school gender ($\chi^2 (28) = 19.160, p = 0.893$).

Table 5.23: Length of teaching blocks per subject (n = 88)

<table>
<thead>
<tr>
<th>Question</th>
<th>Teachers’ Response</th>
</tr>
</thead>
</table>
| How long are the teaching blocks per subject? | • “Each class gets 3 periods each of Physics, Chemistry and Biology for half the year on a rotating modular basis. Single periods of 40 minutes, doubles 80 minutes.”
|                                               | • “Biology is given priority and hence takes up half the year. Other two subjects are even in length.”
|                                               | • “10 weeks.”
|                                               | • “TY Science split as teacher wishes” generally. Few weeks on each.”
|                                               | • “Varies depending on interest. Each student does 1 double of all three subjects each week.”
|                                               | • “One month at a time, rotated.”
|                                               | • “30 weeks – 1 single and 1 double = Physics, 30 weeks, 1 single and 1 double = Biology and Chemistry and Environmental Studies.”
|                                               | • “TY Science split as teacher wishes generally. Few weeks on each.”
|                                               | • “At least 3 weeks”

Due to the variation in how Science is provided in the Transition Year among schools a free response question examining the length of the teaching blocks per Science subject were included in the questionnaire. Table 5.23 illustrates the wide variety in the teachers’ responses and how time for Science is organised and provided for the pupils.
The allocation of class time and length of teaching blocks per Science subject in Transition Year Science begins to give an image of the variation in organisation of Transition Year Science among schools. In order to allow for a clearer picture free response questions were included in the instrument. The question answered in Table 5.24 investigates how Science is organised in the Transition Year within the various schools.
Table 5.24: The organisation of Science in the Transition Year (n = 88)

<table>
<thead>
<tr>
<th>Question</th>
<th>Teachers’ Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>How is Science organised for Transition Years in your school?</td>
<td>“Not very well – it is completely left to the teachers own ideas on what to teach.”</td>
</tr>
<tr>
<td></td>
<td>“Physics is a module (i.e. 2 doubles a week) i.e. 6 week rotation. Young Scientist was an option before Christmas – 2 class groups – became Biology module after Christmas.”</td>
</tr>
<tr>
<td></td>
<td>“Students are divided into those who have had JC Science and those without any prior Science. Three subjects are taught to each of the two groups on a rota basis among 3 teachers. Students get 10 weeks for each subject.”</td>
</tr>
<tr>
<td></td>
<td>“Timetabled against Business/Art so students choose or end there by default. Taught as independent modules 1. Thinking and Problem Solving, 2 Reading Science, 3. Infinity Project (digital signal processing), 4. Careers.”</td>
</tr>
<tr>
<td></td>
<td>“One teacher does Biology all year. The Chemistry and Physics teachers swap students every 6 weeks.”</td>
</tr>
<tr>
<td></td>
<td>“I teach Physics, Chemistry and Biology integrated into the single subject. I try to balance it as much as possible to cover some LC content also. Between teachers taking the Science classes.”</td>
</tr>
<tr>
<td></td>
<td>“There is a Physics teacher, a Chemistry teacher and a Biology teacher and they each teach their own discipline in TY.”</td>
</tr>
<tr>
<td></td>
<td>“Students get 10 weeks for each subject. 15 weeks – Problem Solving Course. 15 weeks – Student selected modules in LC Physics, Chemistry and Biology.”</td>
</tr>
</tbody>
</table>
The organisation of Transition Year differs greatly from school to school, from some schools displaying little whole school co-operation and discussion, to highly organised schools offering a wide variety of subjects including the Sciences, and organising the experience very well for students. These responses are a sample of the responses from teachers. The full list of responses is in Appendix H.

5.3.2.2 Leaving Certificate science subjects offered

Research has indicated that schools differ in their provision of the Science subjects at both Junior and Leaving Certificate level (Smyth et al. 2005). The subjects offered at Leaving Certificate are illustrated in Figure 5.25.

70.5% (n = 62) of schools offer Physics, Chemistry and Biology at Leaving Certificate level. However there are five science subjects available at Leaving Certificate level (Physics, Chemistry, Biology, Agricultural Science and Physics/Chemistry) and only one (1.14%) school offers all of these. One (1.14%) school also offers only Biology at Leaving Certificate level. This is the only science subject to be offered by itself at Leaving Certificate level. Tables 5.26 and 5.27 below show how the type of school and gender of the school impacts on the Science subjects offered at Leaving Certificate level.

![Figure 5.25: Breakdown of the subjects and subject combinations offered at Leaving Certificate (n = 88).](image)
There are clear differences in the subject provision at Leaving Certificate among the various types of schools, with Community and Comprehensive schools having a higher provision of the three primary Science subjects. Vocational schools have a higher provision of Agricultural Science, compared to the Secondary and Community and Comprehensive schools. Biology enjoys an extremely high level of provision, with 100% of schools offering the subject. Chi-square tests were conducted to further explore these differences, but none of the differences in provision of subjects among the school types were significant.

<table>
<thead>
<tr>
<th>Subject</th>
<th>Secondary School (n = 60)</th>
<th>Vocational School (n = 14)</th>
<th>Community and Comprehensive School (n = 14)</th>
<th>$\chi^2$</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physics</td>
<td>55 (91.7%)</td>
<td>13 (92.9%)</td>
<td>14 (100.0%)</td>
<td>1.244</td>
<td>0.824</td>
</tr>
<tr>
<td>Chemistry</td>
<td>59 (98.3%)</td>
<td>12 (85.7%)</td>
<td>14 (100.0%)</td>
<td>6.077</td>
<td>0.129</td>
</tr>
<tr>
<td>Biology</td>
<td>60 (100.0%)</td>
<td>14 (100.0%)</td>
<td>14 (100.0%)</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>Agricultural Science</td>
<td>10 (16.7%)</td>
<td>4 (28.6%)</td>
<td>3 (21.4%)</td>
<td>1.080</td>
<td>0.603</td>
</tr>
<tr>
<td>Physics &amp; Chemistry</td>
<td>3 (5.0%)</td>
<td>1 (7.14%)</td>
<td>1 (7.14%)</td>
<td>0.164</td>
<td>0.921</td>
</tr>
</tbody>
</table>
Once again, some clear differences are exhibited when the provision of Science subjects at Leaving Certificate level, with Single-sex male schools having the highest levels of provision in all subjects except Physics & Chemistry, which was uniformly not offered in these schools. All of the three core Science subjects were well provided for among the schools, though the Single-sex schools did exhibit slightly higher levels of provision, when compared to the Co-educational schools. Chi-square testing indicated that no differences between the schools and their provision of Leaving Certificate Science subjects were to be significant (p < 0.05).

5.3.3 Summary

This sub-section of the chapter has presented results from the data collected in the teacher questionnaire in Phase 1 of this research study. The main findings from this data have aided in the development of how the Transition Year and Transition Year Science is organised and presented to pupils in their schools. The majority of schools become involved with the Transition Year in the 1990’s (60.6%). It is a compulsory year for the majority of schools surveyed (77.3%), yet on average 50.0% of the cohort within the schools take the year. Biology was offered to a greater extent in the Transition Year among the schools surveyed, followed by Chemistry and then Physics. Science in the Transition Year is typically offered in a wide variety of manners, with a huge variety in the amount of time given to the subject among schools. Schools differ in the provision of
Leaving Certificate Science subjects, with the highest levels of provision in Single-sex male and Community and Comprehensive schools.

5.4 Teacher questionnaire (2)

The results from the teacher questionnaire carried out in Phase 2 will be presented in this section. These results will be presented in a similar fashion to those from the teacher questionnaire carried out in Phase 1 of the study, for ease of comparison. 80 teachers responded to this questionnaire out of a potential 135, giving a response rate of 59.3%. The two main sections of these results are the general profile of the schools and the place of Science in the Transition Year.

5.4.1 General profile of the schools

The teachers who responded to this survey (N = 80) came from a variety of different school types, and ethos. The respondents (N = 80) did not always answer every question, and therefore the ‘n’ value indicating the number of respondents to each question varies. Figures 5.18 and 5.19 illustrate the type and gender of the schools who responded to this survey.
The majority of respondents were from Secondary schools (n = 36), followed by Vocational (n = 16) and Community and Comprehensive schools (n = 11). This proportion would be considered representative of the national sample of schools.

Figure 5.18: Type of school offering the Transition year (n = 63)
The majority of schools in this sample are Co-educational schools (n = 37), while both Single-sex male (n = 13) and female (n = 13) schools together comprise of 41.2% of the sample.

5.4.1.1 Is the Transition Year compulsory or non-compulsory?

The Transition Year was a compulsory year in 34.2% (n = 26) of schools, the remaining 65.8% (n = 50) did not have the year as a compulsory one in their school. A higher proportion of Secondary (38.9%, n = 14) and Vocational schools (46.2%, n = 6) had a compulsory Transition Year, particularly when compared to Community and Comprehensive schools, however these differences were not considered to be significant ($\chi^2$ (2) = 3.660, p = 0.150). There were no significant differences ($\chi^2$ (2) = 2.933, p = 0.270) found in whether schools of different gender intake make the Transition Year compulsory or non-compulsory for their pupils. It was noted that single-sex female schools did differ in making the year compulsory when compared to single-sex male and co-educational schools. 53.8% (n = 7) of single-sex female schools had a compulsory
Transition Year, compared to 38.5% (n = 5) of single-sex male schools and 35.6% (n = 21) of Co-educational schools.

5.4.1.2 The introduction of the Transition Year in schools

The Transition Year became available to all schools in 1994, previously to this it was still in its pilot stage, having being first conceived in 1973. The huge variety in when the schools decided to initiate the programme in their schools is evident in Figure 5.20.

![Figure 5.20: The decade the Transition Year was taken up by schools (n = 53).](chart)

Clearly the majority of schools (n = 29) first implemented the Transition Year into their schools in the nineteen nineties. Few schools were involved in the pilot stages of the Transition Year (n = 7), in the nineteen-seventies to nineteen-nineties. A considerable number of schools (n = 17) had made the decision to initiate the year in the last nine years. Chi-square tests indicated that the year or decade that the Transition Year was taken up by schools was not significant for either school type ($\chi^2 (4) = 2.012, p = 0.776$) or of school gender ($\chi^2 (4) = 8.285, p = 0.080$).
5.4.1.3 % pupils taking T.Y. (08/09 & 09/10)

This section examines the breakdown of pupils that take the Transition Year from the potential Transition Year cohort (i.e. from the previous Junior Certificate Year). The breakdown for the school years 2008/2009 and 2009/2010 are given in Figures 5.21 and 5.22 respectively.

The majority of schools (n = 29) had 90-100% of pupils taking the Transition Year, or close to half their pupils taking the year. 23 schools had 100% of their pupils taking the Transition Year. Overall 71.9% of pupils took the year; this figure is close to the national average percentage of pupils who took the Transition Year (73.3%) in the school year 2008/2009. This data was further explored for normality and found to be non-parametric. The non-parametric nature of the data led to Kruskal-Wallis tests being performed. When these figures were compared with the school type (H (2) = 0.056, p = 0.972) and school gender (H(2) = 2.208, p = 0.332) no significant differences were noted. In order to test whether schools’ having a compulsory Transition Year was significant for the uptake of
the year in schools, Mann Whitney tests were performed. It was found that schools that it was compulsory in had 98.7% of pupils taking the year ($U = 76.5$, $p = 0.000$, $Z = -5.007$, $Mdn = 100$) compared to only 57.4% of pupils ($Mdn = 57.4$) carrying on into the year in non-compulsory schools.

Figure 5.22: Breakdown of pupils from the previous Junior Certificate year who took the Transition Year in 2009/2010 (n = 70).

Following on from the percentage of pupils who took the Transition Year in the school year 2008/2009, similar figures were noted in the school year 2009/2010. Once again the majority of schools (n = 37) tended to have 90-100% of their pupils taking the Transition Year. 30 schools had 100% of their pupils taking the year. The average percentage of pupils taking the Transition Year among the whole cohort for this school year was 74.2%, which once again is in line with the national average (76.0%) for this school year. When these figures were compared with the school type ($H (2) = 1.909$, $p = 0.385$) and school gender ($H (2) = 3.353$, $p = 0.187$) no significant differences were noted. However, when whether the Transition Year was compulsory was examined, for the numbers of pupils who took the Transition Year in 2009/2010 significant differences were found between
the numbers of pupils taking the year in which it was compulsory (U = 152.5, p = 0.000, Z = -5.054, \( Mdn = 100 \)) and schools where the year was not compulsory (\( Mdn = 58.8 \)).

### 5.4.2 Science in the Transition Year

This sub-section examines the provision of Science subjects in the Transition Year, among the schools surveyed. This sub-section is further broken down into four segments, looking at the Science subjects offered to the pupils in the schools, how these subjects are offered, how they are organised and the time allocated to Science in the Transition Year.

#### 5.4.2.1 Science subjects offered to pupils in the Transition Year

The various Science subjects can be offered in a wide variety of guises in the Transition Year. While some schools do not offer the traditional Science subjects in the Transition Year, instead offering contextual, real world Science based modules; most schools offer the traditional subjects in one form or another. Figure 5.23 below illustrates the Science subjects offered in the Transition Year schools.
The subject offered most in all schools is Biology (n = 64, 83.1%), followed closely by Physics (n = 61, 79.2%) and Chemistry (n = 59, 76.6%). Agricultural Science (n = 18, 23.4%) and Physics & Chemistry (n = 4, 5.2%) are not popular subjects, whereas a General Science taster is offered by nearly half the schools (n = 33, 42.9%). Chi-square tests indicated that there were no statistically significant differences when comparing the Science subjects offered by school type or school gender, as indicated in Table’s 5.28 and 5.29.
Table 5.28: Breakdown of the Science subjects offered in Transition Year by school type.

<table>
<thead>
<tr>
<th>Subject</th>
<th>Secondary School (n = 36)</th>
<th>Vocational School (n = 14)</th>
<th>Community and Comprehensive School (n = 10)</th>
<th>χ²</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physics (n = 60)</td>
<td>30 (83.3%)</td>
<td>11 (78.6%)</td>
<td>9 (90.0%)</td>
<td>0.549</td>
<td>0.812</td>
</tr>
<tr>
<td>Chemistry (n = 60)</td>
<td>29 (80.6%)</td>
<td>9 (64.3%)</td>
<td>9 (90.0%)</td>
<td>2.534</td>
<td>0.314</td>
</tr>
<tr>
<td>Biology (n = 60)</td>
<td>32 (88.9%)</td>
<td>12 (85.7%)</td>
<td>8 (80.0%)</td>
<td>0.549</td>
<td>0.866</td>
</tr>
<tr>
<td>Agricultural Science (n = 60)</td>
<td>8 (22.2%)</td>
<td>5 (35.7%)</td>
<td>2 (20.0%)</td>
<td>1.139</td>
<td>0.696</td>
</tr>
<tr>
<td>Physics &amp; Chemistry (n = 60)</td>
<td>2 (5.56%)</td>
<td>2 (14.3%)</td>
<td>0 (0.0%)</td>
<td>2.092</td>
<td>0.468</td>
</tr>
<tr>
<td>General Science taster</td>
<td>15 (41.7%)</td>
<td>5 (35.7%)</td>
<td>3 (30.0%)</td>
<td>0.504</td>
<td>0.811</td>
</tr>
</tbody>
</table>

As Table 5.28 above indicates, there were no significant differences in how the Science subjects were offered when the types of schools were compared. However, there were differences noted among the different types of schools. There were higher levels of provision of Physics and Chemistry in Secondary and in Community and Comprehensive schools, when compared to Vocational schools. Vocational schools had the highest provision of Agricultural Science in the Transition Year, and Secondary schools had a greater provision of a General Science taster when compared to Vocational and Community and Comprehensive schools.
There was greater provision of the three primary Science subjects (Physics, Chemistry and Biology) in the Single-sex schools, when compared to the Co-educational schools. Single-sex female schools offered the highest provision of Chemistry in the Transition Year. However, the Co-educational have a greater provision of a General Science taster, followed closely by Single-sex male schools. None of these differences were considered statistically significant.

Further Chi-square testing indicated that schools who did not offer a compulsory Transition Year were more likely to offer a General Science taster ($\chi^2 (1) = 9.413, p = 0.002$) in the Transition Year, when compared to schools where the year was compulsory for its pupils.
5.4.2.2 How subjects are offered to pupils

The citations presented in Table 5.30 below are from the teachers (n = 75) who responded to question 9 in the questionnaire in Phase 2. They outline a sample of the many ways in which Science is offered in the Transition Year. These responses are available in full in Appendix I.
### Table 5.30: How Science subjects are offered to pupils in the Transition Year

<table>
<thead>
<tr>
<th>Question</th>
<th>Teachers’ Response</th>
</tr>
</thead>
</table>
| How are these subjects offered to the pupils? | "Block, no choice”  
10 weeks Physics – Physics teacher, 10 weeks Biology – Biology teacher, 10 weeks Chemistry – Physics/Biology teacher. No choice. Classes rotate for Physics and Biology. E.g. Physics teaches physics programme to two groups.”  
"Banded options i.e. choose one subject of a line containing about 6 options. Repeat.”  
"No choice, but year split in two. Science is opposite to business studies so one half of the class takes science September – December, while 2nd half takes business – then they ‘swap over’ January to May.”  
"All subjects for 10 weeks”  
"They pick them in third year”  
"Every pupil has to do a block of each subject – physics, chemistry and biology. They did 6 weeks of each one.”  
"All students do half a year of physics and half a year of chemistry. Blocked so they rotate from one subject to the other after Christmas. (2 classes in TY only.)”  
"The subject is called TY Science. Teachers decide how long to spend on each subject. All three are covered.”  
"They get to choose 8 subjects for TY. They usually get all 8 preferences unless timetabling issue.”  
"They do biology -2 classes per week for the year, they do chemistry – 2 classes per week for half the year, they do physics – 2 classes per week for half the year.” |
As the responses in Table 5.30 indicate Transition Year Science can be offered to pupils in a wide variety of manners. 46.7% of schools (n = 35) offer Science in the Transition Year and their pupils are not given a choice, the subject is compulsory in the Year. 21.3% of schools (n = 16) offer the subject as a block subject throughout the year, while 24.0% of schools (n = 18) have a modular Science programme in the Transition Year.

5.4.2.3 Organisation of T.Y. Science

While the results presented in Table 5.30 indicated that a nearly half the schools surveyed offer Science as a compulsory subject in the Transition Year, they do not explain how the subject is organised within the year. The results presented in Table 5.31 give a general overview of the type of responses teachers (n = 71) gave to question 4 in the survey.
<table>
<thead>
<tr>
<th>Question</th>
<th>Teachers’ Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>How is Science in the Transition Year organised in your school?</td>
<td>“Different modules in Biology, Chemistry and Physics take place. My biggest problem is the fact that some students did not do science for junior cert, while others have an A in higher level.”</td>
</tr>
<tr>
<td></td>
<td>“3 modules of biology, chemistry and physics and 10 weeks and construction studies. 4 classes and 24 students.”</td>
</tr>
<tr>
<td></td>
<td>“Very well. Biology 1st term, chemistry 2nd term, physics all during the year.”</td>
</tr>
<tr>
<td></td>
<td>“There are four modules in the year c. 2 months each. They have science for 2 modules – one with me and one with a Physics/science teacher.”</td>
</tr>
<tr>
<td></td>
<td>“4 modules – 8 weeks of each module, students do all modules, mixed ability classes, including students with no science at Junior Certificate. Due to lab clash I teach half the module in classroom (4 weeks) but have devised course appropriate for this and it includes weekly practical (lab not required). Second half of the module is lab based.”</td>
</tr>
<tr>
<td></td>
<td>“Currently we use the lab once a week, we could/can use it more when we need it, but we are based in a computer room”</td>
</tr>
<tr>
<td></td>
<td>“Pupils pick their Leaving Certificate subjects at the end of third year and start the course in Transition Year. They also participate in a TY module. So Biology/chemistry/physics/applied maths = 4 classes weekly. TY science module = 2 classes weekly (for 6 week module) All doubles take place in the lab as this is the time pupils carry out the mandatory experiments.”</td>
</tr>
<tr>
<td></td>
<td>“Physics, Chemistry, Biology, Forensic Science. Not every year group has science in labs (too many students, not enough labs.) Science compulsory to Junior Cert.”</td>
</tr>
</tbody>
</table>
The differences in how Transition Year Science is organised from school to school becomes even more apparent as the free responses are examined in Table 5.31. The most common (n = 22, 31.0%) method of organisation is to split the pupils into groups and rotate them through the various Science modules in the school for the year.

5.4.2.4 Number of class periods per week

Given the nature of the Transition Year, with each school having the autonomy to design their own curriculum free year, it is difficult to paint a picture of how Science is offered, on average, in the schools. In order to achieve a more holistic view of the year it is important to combine qualitative and quantitative data. Having discussed how the Science subjects are organised in the year, and offered to the pupils, it is worth quantifying the amount of class time spent on Science within the year. Figure 5.24 below illustrates the amount of time allocated to Science per week in the Transition Year.

Figure 5.24: Number of class periods per week allocated to Science in the Transition Year (n = 76)
A single class period is typically 30-45 minutes, depending on each school’s timetabling needs and requirements. Therefore, given that the data is normal and the mean value is 3.15, it can be said that the average amount of time spent on Science in the Transition Year is 94.5–141.5 minutes per week. One-way ANOVA testing was performed to compare the number of class periods offered in the different types of schools and in the different school genders. For both school type (F (2, 56) = 0.104, p > 0.05) and school gender (F (2, 56) = 1.023, p > 0.05), no significant differences were found. Independent t-tests examining the differences in the allocation of class time in schools that have a compulsory Transition Year (M = 3.40, SE = 0.16) and schools that do not have a compulsory Transition Year (M = 3.00, SE = 0.15) yielded no significant differences (t(74) = 1.821, p > 0.05), but there was a small-sized effect $r = 0.21$.

5.4.3 Summary

The schools surveyed in this sample are representative of the national averages for schools offering the Transition Year. Schools make the Transition Year compulsory for their pupils in equal measures, with no significant differences between these types of schools found. As found in the previous teacher questionnaire, most school initially engaged with the Transition Year between 1990 and 2000. The portion of pupils who take the year in these schools is also in line with the national averages. Science is provided in the Transition Year in all schools surveyed; however the provision is not entirely equal, with all schools choosing to offer the subject in very different fashions. Most schools allocate 2 to 4 class periods per week for Transition Year Science.
5.5 Case Study Schools

5.5.1 Introduction

This section is the final section of the chapter. Case Studies were carried out throughout this research study in 7 different schools. Semi-structured interviews were conducted with both Transition Year Co-ordinators and Transition Year Science Teachers in all of the schools. One Transition Year Co-ordinator (in School 1) asked for her interview not to be recorded using the IC recorder, and noted that she would feel more comfortable talking if the author recorded the conversation by hand as we spoke. The data collected from all sources in the Case Study schools is presented under the following headings and themes for clarity:

- Profile of the Case Study schools,
- Profile of the Transition Year Co-ordinators,
- Evolution of the Transition Year within the school,
- Organisation of the Transition Year,
- Attitudes to the Transition Year,
- Science in the Transition Year.

An interview schedule guided the interviews that took place, each of which lasted approximately 20-30 minutes. Teachers are referred to numerically (i.e. Transition Year Co-ordinator 1, or Teacher 1), with the number that each teacher/co-ordinator has been assigned corresponding to the number of Case Study school that they were teaching in. Interviews were transcribed using Microsoft Word, (all the transcribed interviews are provided in Appendix K) and NVivo, version 8, was used to facilitate the analysis of the transcripts. After a careful analysis of the interview transcripts themes emerged under the sections given above, and these themes were categorised into nodes, using manual interpretative coding.
5.5.2 Profile of the Case Study schools

Table 5.32 below gives a general picture of the profile of the Case Study schools involved in this study. The schools general background, geographic location, type and gender.
Table 5.32: General profile of Case Study schools

<table>
<thead>
<tr>
<th>School</th>
<th>Geographic location</th>
<th>School Type</th>
<th>School Gender</th>
<th>Fee Paying</th>
<th>Year Transition Year was taken up by school</th>
<th>Compulsory or Optional</th>
<th>Number of Transition Year pupils 09/10</th>
<th>Transition Year pupils as % of previous year's cohort</th>
<th>Transition Year fees</th>
<th>School has history with curriculum development</th>
</tr>
</thead>
<tbody>
<tr>
<td>School 1</td>
<td>Mid-West of Ireland</td>
<td>Secondary</td>
<td>Single-sex male</td>
<td>No</td>
<td>1994</td>
<td>Optional</td>
<td>96</td>
<td>77.4%</td>
<td>Yes (€400)</td>
<td>No</td>
</tr>
<tr>
<td>School 2</td>
<td>South of Ireland</td>
<td>Secondary</td>
<td>Single-sex male</td>
<td>Yes</td>
<td>Always</td>
<td>Compulsory</td>
<td>123</td>
<td>100%</td>
<td>Yes (€ not disclosed)</td>
<td>No</td>
</tr>
<tr>
<td>School 3</td>
<td>North-West of Ireland</td>
<td>Secondary</td>
<td>Single-sex female</td>
<td>No</td>
<td>1990</td>
<td>Optional</td>
<td>39</td>
<td>88.6%</td>
<td>Yes (€450)</td>
<td>Yes</td>
</tr>
<tr>
<td>School 4</td>
<td>South of Ireland</td>
<td>Secondary</td>
<td>Co-educational</td>
<td>Yes</td>
<td>Always</td>
<td>Compulsory</td>
<td>58</td>
<td>100%</td>
<td>Yes (€ not disclosed)</td>
<td>No</td>
</tr>
<tr>
<td>School 5</td>
<td>West of Ireland</td>
<td>Secondary</td>
<td>Single-sex female</td>
<td>No</td>
<td>1991/92</td>
<td>Optional</td>
<td>66</td>
<td>78.6%</td>
<td>Yes (€300)</td>
<td>Yes</td>
</tr>
<tr>
<td>School 6</td>
<td>Midlands of Ireland</td>
<td>Vocational</td>
<td>Co-educational</td>
<td>No</td>
<td>1980's</td>
<td>Optional</td>
<td>15</td>
<td>42.9%</td>
<td>Yes (€300)</td>
<td>No</td>
</tr>
<tr>
<td>School 7</td>
<td>Mid-West of Ireland</td>
<td>Secondary</td>
<td>Co-educational</td>
<td>Yes</td>
<td>1985/86</td>
<td>Compulsory</td>
<td>66</td>
<td>100%</td>
<td>Yes (€450)</td>
<td>Yes</td>
</tr>
</tbody>
</table>
Table 5.33: Profile of Transition Year Co-ordinators in Case Study schools

<table>
<thead>
<tr>
<th>School 1 Co-ordinator</th>
<th>School 2 Co-ordinator</th>
<th>School 3 Co-ordinator</th>
<th>School 4 Co-ordinator</th>
<th>School 5 Co-ordinator</th>
<th>School 6 Co-ordinator</th>
<th>School 7 Co-ordinator</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>Female</td>
<td>Male</td>
<td>Male</td>
<td>Male</td>
<td>Female</td>
<td>Male</td>
</tr>
<tr>
<td>Duration of Transition Year Co-ordinator in post</td>
<td>2</td>
<td>1.5</td>
<td>5</td>
<td>11 months</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Previous experience</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Training provided</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Co-ordinator’s subjects</td>
<td>Geography</td>
<td>Maths and computers</td>
<td>Physics, Biology</td>
<td>n/a School Principal</td>
<td>Irish</td>
<td>French, Geography, History</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
5.5.3 Theme: Evolution of the Transition Year within schools

The analysis of the interviews with the Transition Year Co-ordinators in the Case Study schools led to the development of a number on nodes under each theme. The theme ‘The evolution of the Transition Year within the schools has three nodes assigned to it; The schools’ initial uptake of the Transition Year, The evolution of the Transition Year within the school, and the Aims of the Transition Year. The results under the heading of each of these nodes will be presented in the following pages.

Node: Schools initial uptake of the Transition Year

The Transition Year was initially taken up in the Case Study schools for a variety of reasons. The fee-paying schools (schools 2, 4 and 7) initially took the year as they all had six year cycles in their schools. In order to maintain this six year cycle the Transition Year was initiated in these schools.

“there’s a problem that ahh ammm, the cycle, you see our schools, our type of schools, ammm, always had a six year cycle to the Junior, to the Leaving Cert. Now this, when the Junior Cert came in so it was after three, it was there four so it was a three year cycle so this left a vacuum here and really it was becoming two things, basically it was an economic necessity to keep numbers in and offer them this opportunity rather than saying well I’m going off to do the Leaving so it was primarily a deal to try and keep numbers up, otherwise it would have had a serious deficit and problems with the boarding et cetera, et cetera, you know. So because we’re not totally state funded it was important to put in a year which was very ammm full of activities and alternative activities.”

(Previous Transition Year Co-ordinator 1)
Transition Year Co-ordinator 2 believed that having the compulsory Transition Year is “easier from a management point of view as well.” He believed that when “looking at other schools where some of them do Transition Year and some of them don’t… and then when they go into fifth year, like some people have… a bit of the foundation of the Leaving Cert course done and some of them don’t and it’s hard from a… management point of view, from that point of view, what to teach and how to teach it.”

(Transition Year Co-ordinator 2)

Other Transition Year Co-ordinators (Transition Year Co-ordinator 5 and 6) were unsure about when the year was taken up, as they had not been in the school when the year was originally taken up.

School 3 became initially involved in the year due to a change of the school Principal. The Transition Year was viewed as an innovative, cutting edge development in Irish education by the new Principal, which led to the initial uptake of the year in School 3.

“The new nun (new principal) was very sort of very innovative and you know she was very keen to get us into cutting edge at the time, what was new and what was developing in education and she was probably the main person that, you know, instigated Transition Year in the school.”

(Transition Year Co-ordinator 3)

The rationale for the uptake of the year is quite different across the Case Study schools, with the fee-paying one initially taking the year so as not to lose their six year cycle, whereas School 3 became involved in the year in order to become part of ‘cutting edge’ changes in Irish education.

**Node: The evolution of the Transition Year within the school**

When asked about how the Transition Year had evolved within each school, from its initial inception in the 1980s and 1990s, the Transition Year Co-ordinators all had
quite different opinions as to what constituted the evolution of the year within their school.

Transition Year Co-ordinator 3 viewed the evolution of the year in terms of pupil participation rates.

“The year has evolved I suppose hugely in a sense if you could judge it by participation levels ammm. As I say going back to 1990 we did well to get somewhere between 12 and 16 pupils doing it. Now we’d have approximately you know 90 to 91 % of our third year students will opt voluntarily for Transition Year...So we went from maybe having 15%, 20% participation rate, up to in excess of 90% participation”

(Transition Year Co-ordinator 3)

School 3 has a very high uptake of the year, far above the national average of 53.3%, and this is considered indicative of how the year has evolved and become popular endeavour for pupils in School 3.

Other schools viewed the evolution in terms of how the content of the year itself has changed. School 5 has initiated a large cultural focus to the year, which was not previously there, but other than this there have not been considerable changes to the year.

“we introduced an arts week, ahh so the kids are involved in film-making, drama, ammm music for a full week, which is kind of ahh facilitate a five day work shop, ahhh, we’ve introduced a tour to Dublin, which is a four day tour, so they visit museums, basically it’s kind of a culture focus ammm there are various little things like that, that weren’t in it before that are in it in the last couple of years, but there aren’t huge changes to the programme.”

(Transition Year Co-ordinator 5)
School 6 has turned the focus of the year to a more academic one in order to help the year evolve and to move away from the image of the Transition Year as a ‘doss year’.

“we have tended to focus more on the academic side as well whereas I think it… beforehand that was one of the downfalls… of Transition Year. It was seen as sort of the doss year I suppose, whereas we plan out everything in terms of modules… so they have to produce something… you know, on an academic vein we’ll say in each subject area.”

(Transition Year Co-ordinator 6)

Node: The aims of the Transition Year

The overall theme of the aims of the Transition Year Programme, as mentioned by the Transition Year Co-ordinators was the development of maturity in the pupils. Most Transition Year Co-ordinators mentioned maturity as a hugely important component of the Transition Year.

“It’s about maturity, in a synopsis, it’s about ammm changing the, ammm acknowledging the, the development of the student, you know to a young adulthood, moving towards young adulthood and ahh facilitating them in that change in school to become independent, ahh to take responsibility for their own learning ammm and to you know be a senior student, that’s the main aim of it really.”

(Transition Year Co-ordinator 5)
Transition Year Co-ordinator 3 agreed with the main aim of the year being to promote maturity among the pupils, but also noted that the development of new skills was important also.

“I suppose the aims of the programme is probably in keeping with the aims of the Department. It’s to, you know to develop, to…to have things in place that sort of promote sort of maturity whether its social maturity or could be educational maturity, could be vocational maturity, through, through the work experience programme. To you know equip the students with I suppose the skills amm new skills like whether its public speaking, whether its ECDL, whether its typing skills you know..and..and to also amm encourage sort of links with the community and particularly with voluntary groups in the community.”

(Transition Year Co-ordinator 3)

Transition Year Co-coordinator 6 felt that an important focus of the year in her school was not to focus completely on the academic.

“Yes, definitely to form sort of… not focus completely on academic, but that they, that they can produce something on a modular basis. That we’ll say from September to December they do one module in every single subject area and then from Christmas to June they’ll do another module… so that we can show something concrete at the end of the day. I suppose there is more of a focus obviously on academic for Leaving Cert, d’you know, so it is different.”

(Transition Year Co-ordinator 6)
The Transition Year Co-ordinator in School 2 took a more traditional view of the year, believing that the year offered an opportunity to provide “a solid foundation for the Leaving Certificate academically” as well as the promotion of maturity.

“one is to provide a solid foundation for the Leaving Cert academically… am, two to develop the young fellas. Ah… maturity would be a big thing. Commitment would be a big thing. Am… working as part of a team… and developing them as… am, self-directed learners, where they’re learning on their own as opposed to third year or fifth year you just give them homework to do at home for us. In fourth year get a lot of stuff that they’ve to work well over the free time on the one… that’s a big part of fourth year.”  

(Transition Year Co-ordinator 2)

The Transition Year aims in the Case Study schools are generally in line with the aims set down by the Department of Education and Skills. However, the most important aim of the year for these Schools is to develop maturity in their pupils, and to thus help set them on the path of becoming self-directed and focused learners.

When compared with the Leaving Certificate programme aims, Transition Year Co-ordinators believed that there were significant differences between the two programmes.

Transition Year Co-ordinator 6 expanded on this point, noting that “it is, very much more laid back in, in Transition Year. It’s not for Leaving Cert and we are driving the students towards points and college and you know… getting the best result that they can get themselves.” The Leaving Certificate programme offers “no work experience, there’s no, kind of, day trips, there’s no workshops.”

Transition Year Co-ordinator 2 also felt that the aims of the Leaving Certificate were quite different to those in the Transition Year, but given that the Transition Year is explicitly utilised as an extra Leaving Certificate year in School 2, achieving a balance between the academic aims of the Leaving Certificate programme and the looser flexibility of the Transition Year was a challenge.
“Well I suppose the Leaving Cert aims are very, am... rigid as regards the academic performance. Ah... there’s a bit of flexibility with the Transition year ones. Am... the big thing we have to address in the year when we start off is the balance between... the academic and the non-academic side of it... and again, while it’s not perfect here I think we’re... we’re getting there. I think, am... that, am... we’ve a good enough balance between the two of them now cause it’s definitely not a year off from study like and that’s shown in the results that they get in sixth year.”

(Transition Year Co-ordinator 2)

**Node: The impact of the Transition Year on the school**

The Transition Year has had a positive impact on all of the Case Study schools investigated in this study. The Transition Year Co-ordinator in School 1 believed that the year helped to keep the teachers ‘fresh’ and allowed the pupils to view their subjects in a different light. The pupils’ maturity, that is so frequently mentioned by advocates of the Transition Year, was also mentioned by Transition Year Co-ordinator 2. He felt that this enhanced maturity showed a “direct correlation between the lack of discipline problems” in the senior cycle of the school.

Four schools mentioned the impact of the Transition Year in terms of the whole school and the wider community. The Transition Year Co-ordinators in Schools 3, 4, 5 and 7 all believed that the positive impact of the Transition Year permeated throughout the whole school, and enhanced relations with the wider community.

“I think it’s a year that a lot of our Junior students aspire to doing and that they can’t wait to get onto the Transition Year Programme. I think outside of school as well you’ll see much better relationships with the the wider community, like with agencies in the wider community between coming into schools and work experience various things like that.”

(Transition Year Co-ordinator 3)
Transition Year Co-ordinator 4 noted that the Transition Year pupils have a large responsibility for the organisation of a lot of school activities, benefitting the whole school and other pupils.

“I mean one, one thing is the Transition Years are involved in organising, we’ll say, lots of nice activities, you know, enjoyable activities, so in that sense they add a certain positive atmosphere. They’re involved in organising sporting activities, the musical, other activities which involve other students in school and… other students benefit from that in terms of enjoyment…Ammm you know they, you know we get a lot of requests for charity fundraising things, now we, we kinda have to, have to restrict that in some way, so they contribute you know, to the community as well, they, they’re out, they do a community awareness programme where they work with say people with disabilities or they work with older people that type of stuff, so they it’s, it’s, I think it’s positive the overall.”

(Transition Year Co-ordinator 5)

The Transition Year pupils provide a model for other pupils in school 3, a model of being “proactive in school rather than being you know, ahh passive” so that other pupils, “see the Transition Years taking on an active role” creating “an excellent role model for the younger students.” (Transition Year Co-ordinator 5)

Transition Year Co-ordinator 7 also believed that the Transition Year had a positive impact on the whole school and the wider community, but also commented on the improved pupil-teacher relationships brought about by the year.

“It also makes the students look at the teachers in a slightly different manner you know, and I think the pupil teacher ahh, interaction ahh is better. I’m not saying that its more loose, but there’s a little bit more respect on both sides and I think that sometimes it can be easier to get work out of them. Like, those who shall we say have skipped in the past, you’re still almost teaching them in the same way that you would during first year and second year, you know, and they still expect to be taught in that fashion. It’s still very much a case of spoon feed, spoon feed.”

(Transition Year Co-ordinator 7)
The Transition Year Co-ordinator in School 6 believed that the Transition Year had a positive impact

“insofar as it keeps, it, you know, keeps the students in the school obviously that extra year. In terms of maturity, like anyone who... definitely in my experience of the last three years, you see the students who have gone through... the extra year in school they’ve definitely matured... d’you know... and they’re more... they’re better prepared then for fifth and sixth year”

(Transition Year Co-ordinator 6).

Overall, the Transition Year Co-ordinators were very positive about the year and the impact it had on the whole school. Transition Year Co-ordinator 7 noted that this “can be sometimes very hard to pin, the definitive impact down, ok, it’s more general, it’s more of a sense and it permeates through the whole year.”

**Node: Budget**

Budgeting was previously discussed in terms of the impact of a Transition Year budget on Science in Chapter 7. However, throughout the interviews with the Transition Year Co-ordinators issues surrounding the feasibility of the Transition Year, and difficulties in recent years due to budgeting constraints, became a facet of every interview.

Only one school (School 2) had never received a Department of Education and Skills grant for the Transition Year, due to it being a fee-paying school.

Transition Year Co-ordinator 3 felt that catering to and organising the Transition Year had “definitely become more difficult” in recent years.
“I suppose the positive side of that is that you know a lot of people that you’re dealing with whether it’s bus companies or agencies or say adventure centres, their prices actually came down a little piece as well and you’re in a better sort of bargaining position as well, but definitely this year, I would have found it more difficult to collect the money and encourage it to bring it in, and when you see them coming and, like before it’s the right pay 200 in September and the balance in January, but now its coming in in you know 20’s here, a 50 there, that type of thing, so you know. It definitely has affected them.”

(Transition Year Co-ordinator 3)

Another Co-ordinator (Transition Year Co-ordinator 5) felt that there was currently “a little bit of ahh uncertainty about the future of funding, what the funding situation is and how that would impact on the take up of Transition Year” This uncertainty was due to the school no longer receiving the Transition Year grant for its pupils due to Governmental budget cuts. (Transition Year Co-ordinator 5)

School 7, (a fee-paying school) also noted that they were no longer in receipt of the Department of Education and Skills Transition Year grant.

All schools also had a budget for the Transition Year. The Transition Year Co-ordinator in School 7 said that while there is a budget for the year, the school are currently being more proactive in how they offer the year to their pupils, as they do not have the funds for as many excursions and modules.

“Ok, so, ammm, is there a budget. I don’t know that there’s a specific budget where we say that amount is allocated and you can’t go over it. Ahh, we would look at, we would look at everything. (Principal) has been very good. Any time that we have gone to him with something, really he hasn’t said no. Yeah, alright, but you don’t push it. We’re being a little bit more careful now. Ahh, let me see, we did a dozen trips last year, maybe we’re down to ten or eleven this year. We’re just being a little bit more proactive in the way that we go about things. And some of the, now I don’t know if this is going to come in here, but in terms of budget, an awful lot more of our modules this academic year are being delivered in-house rather than putting it to an outside individual or bodies. Ok so last year for example we did a module on first aid,
we’re not doing that this year. Amm this year (Home Economics teacher) is doing something on food, ahh and that’s in-house, ok, so, but its part of her timetable. Whereas last year that might have been given out to someone else and we would have been paying for it.”

(Transition Year Co-ordinator 7)

Only one school, School 6 noted that they were happy with their Transition Year budget, as the school Principal was excellent in providing for them.

“As in, if we need money for anything, like the Principal and that, he’s excellent, he’ll always provide for whatever. You know, if there’s anybody coming in, like we’re doing a workshop on an introduction to Law on Friday. That’ll be paid for… d’you know what I mean.”

(Transition Year Co-ordinator 6)

Overall, juggling a Transition Year budget is an issue for the Case Study schools’ Transition Year Co-ordinators. In order to cope with recent budget cuts Transition Year Co-ordinator 1 said that the school fees for pupils taking the Transition Year jumped from €200 (before the Transition Year grant was cut) to €400. She believed that the cost of the Transition Year is significant, and that this can lead to disparity in how it is offered to pupils and in the pupils that take the year. However, most Case Study schools in this research study did have protocols in place to allow equal access to their Transition Year programme.

5.5.4 Organisation of the Transition Year

Node: The organisation of the Transition Year

The guidelines for the Transition Year (1993) state that taking a whole school approach is desirable when organising the year within the school. This is exemplified in School 4, where by virtue of the size of the school (small school) it is considered very much to be a whole school experience.
“Transition Year is a whole school experience. Virtually every member of the teaching staff… teaches Transition Year. So everybody has an involvement in it.”

(Transition Year Co-ordinator 4)

Similarly in School 5 the staff has a planning meeting, but also have another one with the pupils. “we have an assembly planning meeting with them.” (Transition Year Co-ordinator 5)

School 3 involves all in the planning and organisation of Transition Year in their school also.

“I mean we would sit down together like, because its been established in the school for so long like, I suppose everyone evaluates their own area and there’re always modules that are introduced and others that are, you know cut. The students evaluate them as well, and if, if we saw like you know, a lot of people target a particular area and say it wasn’t that beneficial we’d like, have to address that on the actual timetable but am we try as far as possible to keep it fresh and to let it evolve, because every year there’s some amount of change in it which is am important. We generally speaking across the board, it doesn’t matter if its religion we sit down as a group and design it and we you know look at their last years programme that they have in front of them and we wanted to see what worked well what didn’t work well, what changes we’d have to make if its whole scale, if its small you know.”

(Transition Year Science Teacher 3)
Schools do differ in both how they offer the subjects in the year and in the manner in which they plan to offer them.

“we kind of distinguish between that academic and non academic, so the academic would be set... so they’d maths class as normal every day. And then the middle part of the day, the two classes after... these two classes now... are Transition Year options... so that’s where they do their media studies, their computers, their leadership programmes, their science options and things like that.”

(Transition Year Co-ordinator Teacher 2)

“we have a series of year long courses which just run for a year, and... we have a series of modular courses which just run... so the modular courses they do nine weeks and they rotate through them and the yearlong courses they choose for the whole year.”

(Transition Year Co-ordinator Teacher 4)

The following excerpt from the Transcript of the interview with Transition Year Co-ordinator 5 exemplifies the variety of activities that take place in the schools Transition Year and the type of planning and organisation that is involved, both on the part of the school staff and the pupils.

“So, they go, they start the year with a two day thing in Killary, it’s an outdoor adventure, it’s kinda bonding and that, ammm they do a law course which is basically two barristers come in and work with them for a day,... do up a kind of a mock court room situation and then they follow that up with, they’ve to do a kind of a multiple choice ah thing about the law and they’ve to write an essay and they, they visit courts, they visit prisons, ah ammm the musical is the highlight of the year ah it happens in January it’s a a big event in the school year, ahh they’d have three shows, three matinees, ahh so they’re working on that at the moment, you know the, that’s facilitated by some outside facilitators, ammm the arts week is the thing I told you about which is again they’re at it for a full week ah it’s kinda hands on project where they, they make a film, ahh we’ve entered it into competitions then, you know the the
CHAPTER 5: SCHOOLS RESULTS

drama people put on a piece of drama at the end of the week, they’re actually, they’ve continued to work on since that week, they’re, they’re continuing to work on the area of drama, I don’t know if any of this is relevant to you? Ah ammm so we do a driving course which they actually really love and I was surprised when we got the, the, the evaluation of the first half of the first term, they were all picking out the driving courses, well not them all, but a lot of them were picking out the driving course and that’s basically where they get you know about an hour and a half on the theoretical input and then they get about half an hour driving or three quarters of an hour in a car and of course they’re all mad into that. They do a mini company thing which is about, it’s an enterprise development thing and ammm they did that up in the Knockranny this year and then later on in the year they will be doing their mini-company activities where they’ll have to develop a kind of a prototype of a a product and ah market research ammm sell it yeah and then there’s a, they do a trade fair….where they can try and sell the products of course, a lot of ..., oh yeah one of the big changes we’ve introduced this year was, it’s big from our point of view, was just, that ah we’ve introduced more space for project work, so they now have three class periods a week, ahhh which they didn’t have before where they come up with ideas for projects they’d like to work on ammm and say for example one of them was a dance off, they organised a dance off for the first years and second years, ok now the amount of work that went into that was phenomenal you know, just organisation and stuff , they they learned a lot from that. Of course they do things, there’s things like that that they love getting involved in. I can give you a list of projects ahhh lets see now just go back here ammmm .... Databases ... ammm one sec now, where did I put it....there’s a projects one here...lets see... the projects, oh yeah, it’s just to give you a sample of the projects their involved in There’s a dance-off....they were organising a fashion show, a trip to the gaeltácht, there’s a group putting together a concert, you know, the performing, pyjama party for our first years, these now, some of these don’t didn’t happen, coz they tired, RTE don’t do tours. and one group took on to organise a tour, a group are organising spike ball which is a form of volley ball. They are ammm delivering a course to Primary schools with in association with Volley Ball Ireland and so they go out and teach kids in Primary schools how to play volley ball over a
six week period and then, the finale of that is when all the Primary school kids, they come in here they run a kind of a fun blitz at the end of the tournament. There’s a group doing, documenting the year so that’s kind of… like one set of projects, now there’s loads of others as well”

(Transition Year Co-ordinator 5)

The organisation of the Transition Year in all schools involves a huge staff and pupil commitment to the year and this commitment is apparent in all Case Study schools. However, it is only completely a whole staff and whole school commitment to the Transition Year in School 4, due to the smaller size of this school. Other schools, while they have a large staff commitment only have a small number of the staff committed specifically to the year, rather than all.

Node: Subjects offered in the Transition Year

All schools offer a wide variety of subjects and modules in their Transition Year. These subjects have been presented in Table 5.34 for clarity and comparison between schools. Clearly all schools offer many subjects in the Transition Year, however Schools such as School 3, 4, 5, 6 and 7 move far beyond the typical academic subjects, offering a variety of modules and subjects to their pupils. School 2 utilises the Transition Year as an extra Leaving Certificate year, contrary to the Transition Year Guidelines (1993). This is clearly seen in the limited subjects it offers in its Transition Year.
Table 5.34: Subjects offered in the Transition Year in Case Study schools.

<table>
<thead>
<tr>
<th>School 1</th>
<th>School 2</th>
<th>School 3</th>
<th>School 4</th>
<th>School 5</th>
<th>School 6</th>
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*Node: How teachers are chosen to participate in the Transition Year*

Teachers in the Transition Year are mainly involved in the Year due to decisions being made by school management. This is the case in Schools 1, 2, 4, 5, and 6.

“It’s basically just in terms of your subject area. If that’s what your subject area is… you know your time… it’s slotted into your timetable and that’s it.”

(Transition Year Co-ordinator 6)

While school management are involved in the decision in schools 3 and 7, there is a consultation process with the school staff.

“At the end I suppose of every year we evaluate I suppose what went well in the Transition Year, what didn’t go well in Transition Year, and I suppose we would always look for suggestions for new modules and in staff meetings as well. So you know if, if someone wanted to get involved in it, from the general staff, they’d generally either propose a module or if there’s a vacancy due to retirement or whatever you know the Principal will say like there’s you know a vacancy or whatever you know and does anyone what to come into the T.Y. programme and that’s it. That’s the way we work.”

(Transition Year Co-ordinator 3)

“for example if biology is being put on, for the last two years I haven’t done biology and it’s since becoming T.Y. Coordinator I’ve specifically asked to become more involved in the mainstream teaching biology, rather than teaching in T.Y. so that’s why I’ve Maths whereas in Biology you'll only see a certain number of them…So how are they chosen? That can be due to timetabling, ok? But, plus the fact that if someone expresses an interest and I’d say its like for example now I know (Irish teacher) wants to become involved next year, but he has a couple of specific things that he wants to do with them, alright, so that could be incorporated in.”

(Transition Year Co-ordinator 7)
5.5.5 Attitudes to the Transition Year within the school

**Node: Attitudes of the school staff**

Transition Year Co-ordinators reported an overall positive attitude of their colleagues to the Transition Year, but this positive attitude was emphasised more so in Schools 1, 4 and 5. The Transition Year Co-ordinator in School 1 noted that the staff were very supportive, particularly at this time when the budgeting has become more difficult. School 4 reported equally positive attitudes, noting that as they were a small school, the Transition Year becomes a whole school, whole staff experience.

“Very positive! Ah... with a staff our size, Transition Year is a whole school experience. Virtually every member of the teaching staff... teaches Transition Year. So everybody has an involvement in it....And... many people, ah... give additional time to it outside their formal teaching time.”

(Transition Year Co-ordinator 4)

The Transition Year Co-ordinator in School 4, who is also the school Principal, recognised that his staff is very supportive of the year, with many giving up personal time to become involved.

“Am'mm, I’d say, well there’s about, we’ve a staff I’d say of about fifty and I’d say about twenty five of them are involved directly with Transition Year am'mm and basically yeah just the attitudes, I mean people see Transition Year as being different so they give it a little bit more, you know, scope so students are involved in things, they, they’re more likely to you know they’re supportive, sometimes actively supportive sometimes passively supportive am'mm, but the, and then there’s kind of a smaller group of teachers who are very, very much involved in, mainly the two coordinators myself and (name of other Transition Year Co-ordinator) and then there’s a year head ahhh for Transition Year who deals more with kinda discipline and attendance and absences and that type of thing. Am'mm and then there are teachers who would be kind of ammm available to help out with any kind of stuff.”

(Transition Year Co-ordinator 5)
The teachers in School 5 are recognised for enjoying the scope that a curriculum free year such as the Transition Year offers to both themselves and the pupils.

While the other schools (Schools 2, 3 and 7) involved in the Case Studies also reported positive staff attitudes to the Transition Year, they mentioned that there are mixed feelings in their schools with regards to the year. The Transition Year Co-ordinator in School 2 felt that there was an age gap leading to the differences in staff attitudes in School 2, with the younger members of staff more actively involved and enthusiastic about the year.

“Being honest about it, the younger staff I suppose... would be more interested in doing it and more interested in am... in... I'm looking at (Transition Year Science Teacher) when I'm talking about the younger members of staff. Am...in doing stuff and getting involved in it. Whereas a lot of the older staff I suppose that were in the school before Transition Year started mightn’t be that interested in it.”

(Transition Year Co-ordinator 2)

Transition Year Co-ordinator 2 put forward possible reasons for this disparity in attitudes towards the Transition Year, observing that “a lot of teachers prefer the set course because you can do stuff on, am... and then if you’re kind of put into an area where there’s no syllabus, there’s nothing to follow. There could be a lot of work involved in it. You have to design stuff or do stuff yourself so that can really am... challenge them.” The autonomy and freedom that the lack of a curriculum in the Transition Year offers is seen as a stumbling block for many teachers, with some too uncomfortable with this unfamiliar territory.

A similar display of attitudes and rationale for attitudes was reported in School 7. While the Transition Year team itself “is very committed” and “very conscious of the way that we have to teach T.Y.” There are “some teachers who are not comfortable with that style of teaching” Transition Year Co-ordinator 7 believed that this could perhaps be due to the fact that “it’s not just a style of teaching, but you have different ahh, you’ve different methodologies, and you’ve different methodologies of assessment, and they’re not conforming, you know, yeah.” The teaching and learning styles encouraged in the Transition Year are often unfamiliar to teachers, and the
differences in teaching a set curriculum when compared to teaching a free self-designed one can present many difficulties for teachers.

The reasons for mixed staff attitudes in School 6 were different to the other Case Study schools, the Transition Year Co-ordinator in School 6 noted that the amount of pupil absenteeism due to other Transition Year activities could lead to frustration for the staff teaching in the year.

“Again positive, but you do get mixed, you do get mixed results.” “As in some people will think ‘Oh I haven’t seen them in ages’ because, you know… and maybe it is the day that they have them… it’s hits, that you know they always seem to be gone on a Friday or whatever it is… and… Yeah so I suppose they will find it difficult to get… you know, subjects done with them… work done with them.”

(Transition Year Co-ordinator 6)

While attitudes to the year are generally positive, there are teachers who are uncomfortable with aspects of the year, and find this difficult to adapt to, therefore leading to poorer attitudes towards the Transition Year

**Node: Attitudes of the pupils**

Every Transition Year Co-ordinator interviewed felt that their pupils displayed positive attitudes to the Transition Year Programme. However, in all schools other than Schools 1 and 5, this was tempered with only if the pupils make a “conscious effort to participate” in the year. (Transition Year Co-ordinator 7)

“Yeah, ahhh in general they love to, most of them, I mean there are girls who are in the, undecided we’ll say as to whether to do it or not and...ammm some of them you know there’s…. This year there’s one girl who started it and then switched to fifth year, ammm there’s some girls who don’t do it because they feel they’re too old, you know that they’re going to be in school another year, you know, but generally the attitude is, is good.”

(Transition Year Co-ordinator 5)
The Transition Year Co-ordinator in School 2 felt that while the pupils’ attitudes towards the year were positive, there was a continual battle to ensure that the year was not seen as a ‘doss’ year.

“Depends on the year like. This year’s group now were excellent. If you’re asking in general in relation to the school… you’re always fighting… as regards Transition Year, as a doss year, ‘it’s a year out’ you know and things like that so you’re always fighting that. But I think we’re improving I think as we’re going along. They’re doing more and more stuff and they seem to be enjoying it more. The feedback that we’re getting from the parents is good, the feedback that we’re getting from the kids is good so… going back to the previous question, while it’s not perfect, we always can improve on it. I think the general consensus on it now is that it’s a worthwhile year. Which is probably the best reflection that we could get on it.”

(Transition Year Co-ordinator 2)

Other Transition Year Co-ordinators did not mention the issue of the year being viewed as a waste of time, but rather that it could be difficult to get all of the pupils in the year to fully participate in all the Transition Year had to offer.

“They’re good. I mean the students themselves… they would generally have a good attitude this year, some are quite lazy… and it’s very hard to get them motivated… you know kind of the lazier ones who really want to be spoon-fed very much so and have everything organised for them, d’you know. Whereas others then are very independent learners. They’ll, you give them a topic and they go and research it and you know… Yeah, but generally they are, they’re quite positive.”

(Transition Year Co-ordinator 6)

The Transition Year Co-ordinator in School 3 agreed with this sentiments, noting that a small proportion of pupils often ‘opt out’ of the opportunities the Transition Year has to offer, but that overall the pupils would be very positive towards the year.
“The vast majority, like, we would always encourage them you know, from the point of view, to participate and, and to get fully involved in the year right from the start even if they think that something is am you know, not their scene, or whatever we’d encourage full participation. That’s not to say, but every year we’d get 80/90% of the students would get fully involved and there is always a group that opt out of everything, you know? That they, no matter what you put on they decide not to go with it, they would get least amount from it. But as far as I’m concerned if you participate in it you get all the benefits that’s associated with the year.”

(Transition Year Co-ordinator 3)

Transition Year Co-ordinator 4 noted that perhaps the issue is that getting the pupils “to move outside their comfort zone... is always a challenge.”

This is the issue in most schools offering the Transition Year across the country, and it could also be said in many walks of life. Engaging in the unknown and unfamiliar is difficult, particularly for an adolescent. However, the majority of pupils, particularly those who engage well with the Transition Year find it an enjoyable experience and display positive attitudes to the year.

**Node: Strengths of the Transition Year**

The Transition Year Co-ordinators interviewed in the Case Study schools believed that there were a lot of different strengths of the Transition Year. The main strength, mentioned by six of the seven Co-ordinators, was the maturity gained by the pupils, on completion of the year. Transition Year Co-ordinator 1 believed that a significant strength of the year was the maturity that it helped to develop in the pupils, and the confidence that they developed. The Transition Year Co-ordinator in School 2 agreed with this, believing that the main strength of the year “In general is maturity.”
“A lot of the Transition Year would be kind of doing things that they have to take charge of themselves as regards projects... I suppose experiments and things like that. Whereas when you’re coming in the Leaving Cert Cycle you mightn’t have time to be doing those things. You’ve to be, get the course done and all that kind of stuff so from that point of view I think that’s the main point of it.”

(Transition Year Co-ordinator 2)

Transition Co-ordinator 3 believed that the development of maturity among the pupils was one of the main benefits of the Transition Year, but that the “acquisition of new skills” and the “increased competency in their own abilities” were also keenly developed in pupils who participate in the Transition Year. A key strength of the Transition Year, as seen by Transition Year Co-ordinator 3, was the widening of the pupils’ circle of friends and social groups. The pupils, “through mixing of various groups” widen their “circle of friends significantly going forward into Leaving Certificate.”

Transition Year Co-ordinator 5 reported that a strength of his schools’ Transition Year was the pupils themselves, as they are “great, ah ah they’re enthusiastic, they tend to, get in, to want to get involved in things and that’s a big help”. This relates to the positive attitudes that the pupils have towards the year, which loops into a feedback system, with a whole school approach being quite important for a strong Transition Year. Maturity on the part of the pupils is also considered a strength in School 5, as is the lack of curriculum in the year. Transition Year Co-ordinator 5 felt that the “Transition Year Programme in a school...moves outside the kinda, the strict, ahh the restrictive curriculum and ahh gives a chance for people to develop talents or develop, to flourish in other areas.” This is viewed as a strength of the programme in this school. Transition Year Co-ordinator 4 reinforced this theme as a strength of the year, believing that the year “gives them the opportunity to engage in learning opportunities...that are significantly outside...the narrower confines of the academic programme.”

Transition Year Co-ordinator 7 also mentioned maturity as a strength of the year.
"Main strengths, ammm, definitely the development of the students. It is very, its very apparent when kids they come in at the beginning of fourth year and now they leave at the end, much more mature, ahh much more able to deal with things”

(Transition Year Co-ordinator 7)

Transition Year Co-ordinator 6 did not mention maturity as a strength of the Transition Year, but she commented on the mixture of activities, both academic and otherwise being a key strength of the year.

“I think a good mix of things... between the, the transition elements, you know... like I want to say field trips, but you know day trips, workshops and then the academic side as well. So there’s a good mix for them.”

(Transition Year Co-ordinator 6)

Both Transition Year Co-ordinators in Schools 4 and 7 felt that a strength of the Transition Year was that it allowed for the pupils to make more informed decisions for the subject choices for Leaving Certificate. Transition Year Co-ordinator 4 believed that a key strength of the year was that it offered an opportunity to reinforce the pupils’ academic background.

“I think that it provides am... a chance to reinforce their academic studies”

Overall the Transition Year Co-ordinators were very positive regarding the Transition Year, believing the programme had much strength.

Node: Weaknesses of the Transition Year
While the Transition Year Programme has many strengths, the Transition Year Co-ordinators also believed that it contained weaknesses, both in their school’s programme and in the year in general.

The difficulty in financing the year was mentioned by two Transition Year Co-ordinators (1 and 5) as a weakness of the year. Transition Year Co-ordinator 1 noted that the cost of the year is considerable, with Transition Year Co-ordinator 5 adding that funding is a particular issue this year, leading to some pupils unable to opt to take the year.
“Students have to pay for, to go places, so that’s the difficulty for some students, obviously”

The other issue raised by Transition Year Co-ordinator 5 is linked with the financial issue for the pupils, but was spoken of in terms of the teachers.

“in general, in Transition Year, it’s, it’s as good as, you know, the teams that are working on it. in a sense so, it depends on a lot of goodwill on the part of teachers to, to get involved in things, you know, and ahhh so, I mean, we have that in abundance in this school and, so that’s a big help, you know, but I can see in general how it might be…teachers, if teachers for example are going to be, you know, operating strictly within the, the directives of trade, of the trade union, you know, you could see where there might be areas where that you know, it could, it could be problematic you know”

(Transition Year Co-ordinator 5)

Another weakness mentioned by Transition Year Co-ordinator 3 is the issues surrounding the pupils’ and parents’ perceptions of the year.

“I suppose parents will identify weaknesses in a sense that they just feel that it is just an informal year and feel they that they might get out of study habits. They don’t actually get out of study habits and I suppose they don’t have a formal exam at the end of it so in that sense is a perceived as a weakness I personally don’t believe it’s a weakness, but if they have that study skill it is just like riding a bike, they can pick it up again the following September, that’s am.. it might be perceived as a weakness from the parents point of view, but I don’t see it any sort of weakness in it as such.”

(Transition Year Co-ordinator 3)

While Transition Year Co-ordinator 3 does not view the informal nature of the year as a weakness, he believes that it is often perceived as one.

Following on from the issue of the perception of the Transition Year as too informal a year, Transition Year Co-ordinator 4 noted that he would find promoting the year, and ensuring both parents and pupils alike commit to the year, a challenge.
“every year it’s a challenge. Am… I think one of the challenges is trying to inform parents in advance of the outcoming third years. Am… I think that… it’s…it, you have a framework that might be similar from year to year… but the energy and aptitudes and interests of any particular year group… move in a particular direction. So you kind of have a level of kinda, flexibility to respond to what… the interests are within a group. That, that… you know within a school setting that’s not always easy. Am… and… ensuring, or trying to… ensure that from the pupils perspective it’s… something that they commit to, and see as a meaningful year. Am… I, I don’t think that’s a weakness about Transition Year but I think every year it’s a challenge.”

(Transition Year Co-ordinator 4)

The theme of the Transition Year being an informal year continued on throughout the Transition Year Co-ordinators, while no one viewed this as a weakness, they did believe that it was an issue that impacted on the year in some form or another.

Transition Year Co-ordinator 7, felt that sometimes a pupil not participating fully in the year could be viewed as a weakness, but reflected that this could perhaps be due to the informal nature of the year, and felt that some pupils and teachers were unable to respond to it as such.

“Any weaknesses, there are always weaknesses, and sometimes I suppose a weakness can be down to, it can be down to an inability of the student to actually participate in everything, in, in the T.Y. Programme or in the T.Y. Year. Now, I don’t know whether that’s a reflection on us or in that we don’t give them enough of the things that they want or amm whether its sometimes its an inability of the teachers to teach slightly outside of the box, because T.Y. is meant to be outside of the box, alright, it’s not a formal chalk and talk style of teaching, so its to be able to get something different. Ammm, but to be able to deliver that and quite often, ammm, formal academics are not good at going outside of the box and that’s possibly a weakness that and I’m sure there’s some others as well.”

(Transition Year Co-ordinator 7)
Chapter 5: Schools Results

Transition Year Co-ordinator 6 echoed some of these sentiments, believing that finding the balance between the academic and the informal nature of the year to be a challenge.

“Definitely trying to balance the, the academic and but it’s not all academic as well, d’you know, because some weeks you tend to have lots of different activities on and then we mightn’t have anything for two weeks. So they might see it as, that’d be a downfall like, it’s so boring when they’ve done nothing in two weeks… d’you know.”

(Transition Year Co-ordinator 6)

Generally, the Transition Year Co-ordinators are positive about the year, and are quick to note that they themselves do not believe the informal nature of the year to be a weakness. But they agree that it can be a challenge to accommodate all and convince teachers, parents and pupils that it is in fact a strength of the year.

The financial issues raised by the Co-ordinators are worrying, and perhaps there are greater inequalities in the year than have been previously acknowledged. Smyth et al. (2004) have noted that the Transition Year has been typically taken by pupils from higher socio-economic backgrounds; perhaps the current economic climate is widening this gap.

Node: The effect of the Transition Year on Science subject choice and achievement at Leaving Certificate

All of the Transition Year Co-ordinators interviewed agreed that Science in the Transition Year did improve pupils’ perspective of the subject, and in some cases did increase the numbers taking it at Leaving Certificate level.

Transition Year Co-ordinator 6 believed that taking Science in the Transition Year was beneficial and encouraged pupils to take Science subjects for their Leaving Certificate. Due to the informal nature of the year it allowed pupils to see the fun side of the subjects.
She (Transition Year Co-ordinator 6) felt that “it’s not as intense as… you know kind of doing a subject say, for, ah, kind of a points driven purpose, d’you know. It is a more laid back way of seeing a subject I suppose.” (Transition Year Co-ordinator 6)

In School 3 they found that Science in the Transition Year did affect the uptake of Science subjects at Leaving Certificate, but Transition Year Co-ordinator 3 was unsure if this was on a measurable scale.

“I’d say yes. I mean still like we’d say our uptake, say for the physical sciences – the physics and chemistry is quite small and traditionally in a girls school you’re going to have high numbers doing the biology and small numbers doing the physics and chemistry. Certainly, you know over the years from following those science modules, you’ll always get a couple of students who come into your physics or your chemistry and say look because I experienced this in Transition Year and I didn’t think it would be this, physics would be like this for Leaving Cert, or chemistry would be like this for Leaving Cert. It would have an impact, but like everything else not on a scale like, the numbers wouldn’t be huge in physics and chemistry there, you’d have a couple coming in.”

(Transition Year Co-ordinator 3)

The Transition Year Co-ordinator in School 7 also felt that the Science subjects in the Transition Year affected the uptake of the subjects at Leaving Certificate. However, School 7 does not have compulsory Transition Year Science subjects for its pupils; therefore the Science teachers are given the opportunity to ‘pitch’ their subjects to the pupils. Thus, the pupils in School 7 may very well, in a small way, decide at the beginning of the year what subjects they intend to take for their Leaving Certificate.
“I think its having a very good effect...at the beginning of Transition Year part of their induction is that every teacher comes in and gives them a five minute talk, essentially on what they are going to be doing...they sell their subject, ok, because after that they are going to make a choice as to whether they're going to, they're actually going to take the subject in Transition Year...Science is always, amm, is always well, ahh, well taken here in (school name) and it would be above the national average.”

(Transition Year Co-ordinator 7)

In a somewhat similar fashion the pupils in School 2 make their Leaving Certificate subject choices at the end of their third year, and the Transition Year is viewed as an extra Senior Cycle year, in terms of the traditional academic subjects. Transition Year Co-ordinator 4 was quite positive about the Transition Year and Science in the year, but noted that there is a whole school approach to Science, and a whole school ethos regarding Science.

“I think there is a logical structure to the way Science is taught in the school. There, there would be no point resourcing it the way in Junior Cycle, the way we do in Junior Cycle if we didn’t allow that to kind of follow through and expand in Senior Cycle and equally if we didn’t resource it the way we do in Junior Cycle there wouldn’t be that level of uptake in Senior Cycle so... I think the way it’s structured, as things stand now, has a logical coherence to it and from an educational point of view makes philosophical sense.”

(Transition Year Co-ordinator 4)

The beliefs of the Transition Year Co-ordinators is that Science in the Transition Year is important, and has an impact on the pupils’ future subject choices, however they are unable to quantify this impact.
5.5.6 Science in the Case Study schools

The autonomous nature of the Transition Year is a major strength of the year, however, it can make ascertaining the place of Science within the year extremely difficult, as it varies so greatly from school to school. The general theme of Science in the Case Study schools is broken down into two nodes, the first examining the Science subjects offered in the Case Study schools, and the second the planning and organisation of Science in the Transition Year.

Node: The Science subjects offered

As previously discussed, schools can vary greatly in both what Science subjects they offer and how they are offered in their Transition Year. For clarity the seven Case Study schools have had the subjects they offer broken down into tabular format, as indicated in Table 5.35. The results displayed in Table 5.35 will be examined in greater depth in the subsequent pages.
### Table 5.35: Breakdown of the Science subjects offered in the Case Study schools

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<th>School 1</th>
<th>School 2</th>
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<th>School 4</th>
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<th>School 6</th>
<th>School 7</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Physics</strong></td>
<td>Yes, 7 week compulsory module.</td>
<td>Yes, Offered as a Leaving Certificate subject.</td>
<td>Yes, compulsory, module, rotated throughout the year.</td>
<td>Yes, compulsory module rotating with other modules every 4 weeks.</td>
<td>Yes, 1-2 classes per year in a subject taster class.</td>
<td>Yes, compulsory subject which runs all year.</td>
<td>Yes, 12 week optional module.</td>
</tr>
<tr>
<td><strong>Chemistry</strong></td>
<td>Yes, 7 week compulsory module.</td>
<td>Yes, Offered as a Leaving Certificate subject.</td>
<td>Yes, compulsory, module, rotated throughout the year.</td>
<td>Yes, compulsory module rotating with other modules every 4 weeks.</td>
<td>Yes – in the form of ‘Project Science’</td>
<td>Yes, compulsory subject which runs all year.</td>
<td>Yes, 12 week optional module.</td>
</tr>
<tr>
<td><strong>Biology</strong></td>
<td>Yes, 7 week compulsory module.</td>
<td>Yes, Offered as a Leaving Certificate subject.</td>
<td>Yes, compulsory, module, rotated throughout the year.</td>
<td>Yes, compulsory module rotating with other modules every 4 weeks.</td>
<td>Yes –in the form of ‘Project Science’</td>
<td>Yes, compulsory subject which runs all year.</td>
<td></td>
</tr>
<tr>
<td><strong>Agricultural Science</strong></td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td><strong>Physics &amp; Chemistry</strong></td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td><strong>General Science</strong></td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>Other Science based modules</td>
<td>Applied mathematics, 7 week compulsory module</td>
<td>LabScience Module, optional year long module.</td>
<td>n/a</td>
<td>Sports Science module, compulsory module rotating with other modules every 4 weeks.</td>
<td>Project Science, rotating Biology, Physics, Chemistry, Forensic Science and Environmental Science modules.</td>
<td>Electronics</td>
<td>n/a</td>
</tr>
</tbody>
</table>

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Table 5.35 illustrates both the differences in the Science subjects offered and in how they are offered to the pupils in the Case Study schools’ Transition Year.

**Node: How science subjects are offered**

Tables 5.35 and 5.36 indicate that there are differences in how Science subjects are offered to pupils in the Case Study schools’ Transition Year. Once again the nature of these differences and the nature of the Transition Year require that these differences be explored more thoroughly.

**Table 5.36: Allocation of class time to Science in Transition Year.**

<table>
<thead>
<tr>
<th>School</th>
<th>Number of single classes per week</th>
<th>Number of double classes per week</th>
<th>Total number of class periods per week allocated to Science in Transition Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>School 1</td>
<td>1</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>School 2</td>
<td>2 (Each Science subject offered in school)</td>
<td>1 (Lab Science) 1 (Each Science subject offered in school)</td>
<td>4</td>
</tr>
<tr>
<td>School 3</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>School 4</td>
<td>2</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>School 5</td>
<td>1</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>School 6</td>
<td>1 (Physics) 1 (Chemistry) 1 (Biology) 2 (Electronics)</td>
<td>1 (Physics) 1 (Chemistry) 1 (Biology) 2 (Electronics)</td>
<td>12</td>
</tr>
<tr>
<td>School 7</td>
<td>1</td>
<td>1</td>
<td>3</td>
</tr>
</tbody>
</table>
Table 5.36 above shows that the amount of class time spent on Science varies from school to school, both depending on how each school offers the subject and the type of blocks allocated to each subject. The Science subjects offered in the schools were modular for 5 of the 7 schools. However these modules were offered for different lengths of time and in different fashions to the pupils.

“There’s, 4 transition year groups… usually… either three or four [groups] and they all… each group would do a module, so if it was four there would be about seven weeks of… biology, seven weeks of… chemistry, physics and in the last couple of years we’ve brought applied maths in.”

(Transition Year Science Teacher 1)

Transition Year Science Teacher 1 indicates that the length of time each module is offered to the pupils is directly linked to the number of classes taking the Transition Year.

“I teach the physics and biology modules in, then the other teacher that’s involved does the chemistry and physics rotate them and we rotate them throughout the year I take them over for the biology module and my group goes then for the chemistry module.”

(Transition Year Coordinator/Science Teacher 3)

Transition Year Science Teacher 3 (who is also the Transition Year Co-ordinator in school 3) notes that the modules are rotated throughout the entire year.

“Ammm It’s worked in twelve week modules, Ammm Physics, Chemistry, Biology, Ag. Science. Transition Year is compulsory in the school everybody gets a shot at it and they pick the options.”

(Transition Year Science Teacher 7)
School 4, while offering the Science subjects in a modular form rotating every four weeks throughout the year also offer Biology for the entire year. “So they actually do biology for the whole year…And we rotate the physics, the chemistry and the sports science” (Transition Year Science Teacher 4)

School 5 offers Biology and Chemistry in their Transition Year, but offers these subjects under the umbrella of ‘Project Science’, their Transition Year Science module, within which they have “separated it out into coz it’s chemistry, biology and environmental and forensics” (Transition Year Science Teacher 5). Pupils in school 5 also have a subject taster class throughout their Transition Year, in which every subject teacher meets them for one or two classes in the year and essentially gives the pupils a taster of the subject prior to making their decision for their Leaving Certificate. In Science the teacher will explain “what is expected of them in science, you know where most of the classes will be, what the paper is like, they might give them a Leaving Cert. class in the Biology or in the Chemistry or in the Physics depending on what they’re teaching” (Transition Year Science Teacher 5)

School 2 is unusual among the Case Study schools in that it is the only school to offer the Science subjects in the Transition Year completely as Leaving Certificate subjects. However, there is an optional ‘LabScience’ module offered to pupils, which is taught in line with the principles of the Transition Year and is designed to promote scientific thinking and facilitate learning outside the Leaving Certificate syllabi.
“[Leaving Certificate subjects are] pretty much picked going into fourth year so they know what they’re doing. So they do physics, chemistry and biology as…a full, they start it as a syllabus effectively. Ah… but the emphasis is slightly different… as you do project work and they really get the practical work… sorted you know… and the scientific method sorted. You wouldn’t have time to do that if you only had two year course. They’d be too busy learning stuff. And ah… there is a lab science option then as part of the Transition Year. It’s separate… and that way be doing basically anything really that, that… takes the fancy of the people really like… egg drop challenges and… you know and a bit of electronics and you know stuff that you wouldn’t normally get to do in the normal… ‘twouldn’t be anything to do with the… any syllabus.”

(Transition Year Science Teacher 2)

Node: Planning and organisation of Science in the Transition Year

Naturally, with the allocation of time to Science, and the variation in the way in which the Science subjects are offered within the Transition Year, the planning and organisation behind the provision of these subjects will vary also. There are some definite differences between the schools, in how Transition Year Science is planned within the school. The majority of schools involved in the Case Studies have a whole school, whole Science department approach to the planning and organisation of the Transition Year.

“Oh we all come together. We’ve a meeting every year and am… the lab science… it depends on who’s doing it [the lab science] I’m not doing it now this year but the two doing lab science this year would’ve sat down at the start of the year and… tried a few things out you know at the start. Then they, they might change at Christmas again you know and for the next group. But the… the actual core subjects are just off the syllabus anyway and we decide we’re gonna do this, this and this.”

(Transition Year Science Teacher 2)
Transition Year Science Teacher 2 notes that his school not only has a planning meeting to decide how they will offer their Transition Year Science course, but the Science teachers involved in teaching the ‘LabScience’ module also test and plan out various experiments at the beginning of the year.

School 3 also exhibits a collaborative approach to the design of their Transition Year Science programme.

“From our point of view say with subjects say another teacher and myself would sit down and say design the physics content together, am coz I’m not involved in chemistry that would be her, she would design the chemistry and I would design the biology.”

(Transition Year Science Teacher 3)

School 4 exhibit both a collaborative approach to the design of their Transition Year Science programme, and a strong ‘top-down’ ethos in Science with a decision from management and the school Principal to have compulsory Transition Year Science. “all students doing science was a decision made. Made at the top” (Transition Year Science Teacher 4). However, this decision is also supported by the teachers in the school as the “correct decision” (Transition Year Science Teacher 4). Transition Year Science Teacher 4 also notes that the Science department in the school comes together as a whole to design the Transition Year Science programme. “We had a science teacher meeting… and we discussed what we would do. This year was the first year that we had three teachers… sharing the physics and chemistry and then a fourth teaching the biology so we have four teachers involved in... Transition Year science.” (Transition Year Science Teacher 4)

School 5 showed a whole departmental approach, and also a whole school approach, working closely with the Transition Year Co-ordinators to ensure that their Science module fitted in with the whole school themes for the year.
Transition Year Science Teacher 5 also noted that it was not just a theme within the Transition Year that they considered while planning their Transition Year Science programme. The Science department also “wanted to kinda focus more on environmental this year” so that their pupils could “tie in with the green schools” (Transition Year Science Teacher 5)

School 7 had a whole school approach to the design of their Transition Year Science programme also, but they also considered a lot of other factors in their design, feeling that they were competing with popular television programmes such as ‘Mythbusters’ and ‘Brainiac’.

“Am we talked to people in the Universities, that’s what we did, you’d go to in-service training, we’d go to...we’d go to anything, any science show that’s going to entertain. Because, you know as they say, who’s it said it? Bernard Shaw, if you can’t ‘to teach is first to entertain’ If you can’t entertain them you can’t teach them so you must entertain kids ah and you’ve got to compete with ‘Mythbusters’ and you’ve got to compete with ‘Brainiac’, so what you do is you, you try to get your school to send you on all the in-service trainings, on all the activities in the Universities, in the I.T.’s and you always try to get people into the school as well am and then you go online and you look up websites for experiments and you just check the health and safety and if they’re safe you do them. And you try to think outside the box, try and think, think back to when you’re 14, 15 what you want to do, yeah.”

(Transition Year Science Teacher 7)

Two Science teachers in Schools 1 and 6 noted that they were isolated in their design and development of their own Transition Year Science classes. There was no whole school or collaborative whole department approach to the planning of the programme.
“It’s, it’s definitely an individual thing. We don’t come together and say we’ll do this that, in fact we have to kind of careful… am… and it’s usually kind of ‘Oh are you doing that with transition year? Am, I was kind of thinking of doing something the same’, d’you know and I’m thinking now of, am… sort of the, the forensics… (name of Chemistry teacher) and myself need to be careful… not to overlap there.”

(Transition Year Science Teacher 1)

Transition Year Science Teacher 1 found this to be slightly problematic, and noted that when teaching her Biology module there could have been a lot of overlap between her medical physics topic and the Transition Year physics module.

“But like the medical physics thing now that I’m doing - the physics teacher could just as easily have grabbed onto that but they didn’t thank God so… (laughs) I didn’t have to change.”

(Transition Year Science Teacher 1)

Transition Year Science Teacher 6 noted that “It’s each to their own, each to their own and as I say I would kind of change it from year to year anyway. There’d be no two years… that I would do the same thing at all.” However, the timetabling of the Science subjects ensures that the subject specialist teachers are allocated their own subject in the Transition Year, which Transition Year Science Teacher 6 believes is extremely important.

“It’s organised very well here in the school in that, am… unlike Junior Cert where you have the one teacher teaching the three disciplines… the, the relevant specialists, am the relevant specialists… teach their particular specialism.”

(Transition Year Science Teacher 6)
Five out of the seven Case Study schools have taken a whole departmental approach to the planning of Science within the Transition Year, wherein the other two schools (School 1 and School 6) there is a lack of communication and collaboration between the Science teachers in the planning and design of their Transition Year Science programme.

5.5.6.1 Uptake of Science at senior cycle in the Case Study schools

Table 5.37 indicates the uptake of the Science subjects in at senior cycle in the Case Study schools.
## Table 5.37: Uptake of Science at senior cycle in Case Study schools

<table>
<thead>
<tr>
<th>Subject</th>
<th>School 1</th>
<th>School 2</th>
<th>School 3</th>
<th>School 4</th>
<th>School 5</th>
<th>School 6</th>
<th>School 7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physics (5th year)</td>
<td>17 (13.7%)</td>
<td>50 (40.7%)</td>
<td>11 (25.6%)</td>
<td>14 (11 male, 3 female) (24.6%)</td>
<td>0 (0%)</td>
<td>n/a</td>
<td>18 (17.3%)</td>
</tr>
<tr>
<td>Physics (6th year)</td>
<td>24 (19.2%)</td>
<td>33 (26.2%)</td>
<td>--</td>
<td>15 (12 male, female) (31.9%)</td>
<td>3 (0%)</td>
<td>6 (25.0%)</td>
<td>12 (13.8%)</td>
</tr>
<tr>
<td>Chemistry (5th year)</td>
<td>17 (13.7%)</td>
<td>50 (40.7%)</td>
<td>5 (11.6%)</td>
<td>18 (10 male, female) (31.6%)</td>
<td>14 (17.5%)</td>
<td>n/a</td>
<td>32 (30.8%)</td>
</tr>
<tr>
<td>Chemistry (6th year)</td>
<td>23 (18.4%)</td>
<td>50 (40.7%)</td>
<td>--</td>
<td>17 (10 male, female) (36.2%)</td>
<td>7 (26.1%)</td>
<td>14 (58.3%)</td>
<td>20 (22.9%)</td>
</tr>
<tr>
<td>Biology (5th year)</td>
<td>38 (30.6%)</td>
<td>70 (56.9%)</td>
<td>25 (58.1%)</td>
<td>48 (25 male, 23 female) (84.2%)</td>
<td>77 (96.3%)</td>
<td>n/a</td>
<td>65 (62.5%)</td>
</tr>
<tr>
<td>Biology (6th year)</td>
<td>39 (31.2%)</td>
<td>71 (56.3%)</td>
<td></td>
<td>25 (11 male, 14 female) (53.2%)</td>
<td>85 (92.4%)</td>
<td>20 (83.3%)</td>
<td>42 (48.3%)</td>
</tr>
<tr>
<td>Agricultural Science</td>
<td></td>
<td></td>
<td></td>
<td>19 (13 male, 6 female) (33.3%)</td>
<td>n/a</td>
<td>n/a</td>
<td>27 (25.9%)</td>
</tr>
<tr>
<td>(5th Year)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Agricultural Science</td>
<td></td>
<td></td>
<td></td>
<td>14 (5 male, 9 female) (29.9%)</td>
<td>n/a</td>
<td>n/a</td>
<td>21 (24.1%)</td>
</tr>
<tr>
<td>(6th year)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
All Case study schools indicated a good level of uptake of Science subjects for senior cycle. Schools 2, 4, 5, 6 and 7 exhibited a much higher uptake than the national average. School 3 also exhibited this for Physics and Biology, but not in Chemistry. School 1 has a lower percentage of pupils taking Biology than the national average, but Chemistry and Physics are both above the average.

5.5.7 Summary of section

This section will summarise the main findings from the Case Studies conducted in Phase 3 of this research. The Transition Year is the most established in the fee-paying schools, as these schools have had the year the longest. This is due to the fee-paying schools historically being the first to take up the year, as they were traditionally 6 year schools, and needed a year to fill the gap once the four year Intermediate Certificate became the three year Junior Certificate programme. The Transition Year has become a high profile, high uptake school within the Case Study schools examined. The goals of the year in all schools are the maturity of their pupils, and the promotion of pupils as self-directed learners. The year impacts on the whole schools, and this impact was characterised by a lack of discipline issues among pupils at senior cycle, Transition Year pupils designing and developing whole school activities, improved pupil-teacher relationships, the Transition Year pupils becoming role-models for the younger pupils, and a general ‘sense’ which permeates throughout the schools. Financing the year has become more of an issue for schools in the current economic climate, with all schools charging pupils for the year which leads to unequal provision of and access to the year. These financial constraints also limit the experience for pupils who do take the year as trips, activities and other events are hampered by the lack of funds. The goodwill of the community, staff and parents is sorely relied upon. Therefore the importance of whole-school planning and whole-departmental organisation becomes more necessary than ever before. The year requires a considerable commitment from all staff, which is unpaid, and at times unrecognised and thankless.

There are many differences in how schools offer the year, with some sticking mainly to the academic subjects, and augmenting them somewhat with extra activities and events, while other schools embrace the year fully, and create an innovative holistic experience for their pupils.
The attitudes of teachers are positive to the year, but there undercurrents of resistance to change noted. Teachers suggested that perhaps colleagues do not always engage fully with the ethos of the Transition Year, perhaps due to a fear of change, or difficulties in changing their practices. Overall the attitudes of staff are positive, despite the unease that some have with the ethos of the year. Pupils’ attitudes are also positive, provided that they engage and participate with the year.

The strengths of the year come from the maturity the pupils develop in it, a whole school approach, new and different experiences for both staff and pupils, and they manner in which pupils are able to make more informed subject and career decisions. The weaknesses of the year are the financial issues, the fact that it requires much goodwill on the part of the teachers, which may not always be given, a continuous battle against individuals perceptions of the year, balancing the academic with the non-academic, and once again the whole school approach which is difficult to achieve.

5.6 Conclusion

The main findings of this chapter have been in the areas of subject provision and Career-guidance among the schools examined. The implications of these results will be further discussed in Chapter 8, where they will be linked with the findings from Chapters 5 and 6.
CHAPTER 6: TEACHER RESULTS
6.1 Introduction

This chapter will present the results of from the data collected with Transition Year Science teachers. The data has been collected through questionnaires and interviews, all of which were examining the place of Science in the Transition Year through looking at teachers’ attitudes and beliefs about the year, how Science is taught, what type of Science is taught and the teachers’ own professional profile and background. The results will be presented in three sections within the chapter, each section outlining the teachers’ responses from the data collection instrument used. The first section will present results from the teacher questionnaire used in phase one of the study; the second portion of the chapter will outline the results from the teacher questionnaire employed in phase two of the research; and the final section of the chapter will present the results from the interviews carried out with Transition Year Science teachers as part of the case study in phase three of the research.

6.2 Results from the teacher questionnaires ~ Phase 1

This portion of the chapter examines the results from the general teacher questionnaire employed in Phase 1 of the research. This questionnaire was sent to 514 Transition Year Science teachers, and a response rate of 17.1% (N = 88) was achieved. This was considered a poor response rate and while some of the relevant findings of the questionnaire will be presented here it is important to note that this sample cannot be deemed truly representative due to the self-selecting nature of the sample.

6.2.1 Teacher profile

Teachers were asked to indicate their gender: 59.0% were female (n = 52) and 38.6% were male (n = 34). 2.27% of respondents (n = 2) did not answer this question. It is impossible to tell if this data is representative of Transition Year Science teachers, as there are currently no statistics on these figures. However, in the year 2003 40.9% of second level teachers were male and 59.1% were female (Department of Education and Science 2007). It has been noted that “the gender ratio is now approaching 60-40 in favour of women” (Teachers Union of Ireland 2007). This suggests that this
sample is representative of second level teachers in Ireland, though not necessarily of Science teachers.

Figure 6.1: Gender breakdown of respondents (n = 88)
It was decided to examine how experienced teachers teaching in Transition Year Science were, and a question was included examining teachers’ length of time in the job, in order to consider their levels of experience.

Figure 6.2: Length of time teaching Science (n = 88)

47.7% of teachers (n = 42) had been teaching for over 15 years. 19.3% had been teaching between 10 and 15 years (n = 17) and 17.1% of teachers (n = 15) were teaching between 5 and 10 years. Only 10.2% were teaching between 2 and 5 years (n = 9), while 5.6% were teaching for less than 2 years (n = 2). It appears, in this sample, that more experienced teachers teach in the Transition Year Science programme.

Table 6.1 below indicates both the type of schools (in terms of their management structure), and the gender of the pupils in the school.
Table 6.1: Breakdown of school type and gender

<table>
<thead>
<tr>
<th>School Gender</th>
<th>Secondary School</th>
<th>Vocational School</th>
<th>Community and Comprehensive School</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No. of teachers</td>
<td>No. of pupils</td>
<td>No. of pupils (%)</td>
</tr>
<tr>
<td></td>
<td>(%)</td>
<td>(%)</td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>12 (13.6%)</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Female</td>
<td>27 (30.7%)</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Co-educational</td>
<td>21 (23.9%)</td>
<td>14 (15.9%)</td>
<td>14 (15.9%)</td>
</tr>
</tbody>
</table>

The largest number of responses were from single-sex female secondary schools (30.7%). Co-educational secondary schools were the next largest group (23.8%). The fewest responses were from single-sex male secondary schools (13.6%). A study into the Transition Year by Smyth et al. (2004) describes the provision of Transition Year among types of second level schools. As Smyth et al. (2004) noted in their study ‘The Transition Year Programme An Assessment’ single-sex female schools are the most likely to provide Transition Year, followed by community/comprehensive schools. Vocational schools are the least likely to provide the option. At a national level, in the school year 2006/07, 53.8% of schools were secondary schools (all types), 33.8% were vocational schools, and 12.4% were community and comprehensive schools.

6.2.2 Teachers’ attitudes and beliefs regarding the Transition Year and Transition Year Science

The teachers’ attitudes and beliefs towards the Transition Year and Transition Year Science will be presented in this section.

Table 6.2 indicates the responses of the teachers to a number of statements where they were asked to indicate their level of agreement on a five point Likert scale from strongly agree to strongly disagree. Overall the teachers were quite positive towards the year.
### Table 6.2: Teachers’ attitudes and beliefs regarding the Transition Year.

<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly Agree</th>
<th>Agree</th>
<th>Unsure</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transition Year is relevant to the world in which students live in today and to their life experiences (n = 87)</td>
<td>36 (41.4%)</td>
<td>47 (54.0%)</td>
<td>4 (4.6%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
</tr>
<tr>
<td>Transition Year is effective in promoting the health and wellbeing of student learners (n = 88)</td>
<td>24 (27.3%)</td>
<td>46 (52.3%)</td>
<td>18 (20.5%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
</tr>
<tr>
<td>Transition Year promotes the development of personal and social skills in student learners (n = 87)</td>
<td>48 (55.2%)</td>
<td>35 (40.2%)</td>
<td>4 (4.6%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
</tr>
<tr>
<td>Transition Year achieves a good balance between ‘academic’ and ‘practical’ education (n = 87)</td>
<td>20 (23.0%)</td>
<td>42 (48.3%)</td>
<td>22 (25.3%)</td>
<td>3 (3.4%)</td>
<td>0 (0.0%)</td>
</tr>
<tr>
<td>Transition Year uses teaching and learning methods appropriate to the needs of students/learners (n = 87)</td>
<td>15 (17.2%)</td>
<td>43 (49.4%)</td>
<td>25 (28.7%)</td>
<td>4 (4.6%)</td>
<td>0 (0.0%)</td>
</tr>
<tr>
<td>Transition Year uses a good range of assessment methods (n = 85)</td>
<td>7 (8.2%)</td>
<td>39 (45.9%)</td>
<td>24 (28.2%)</td>
<td>13 (15.3%)</td>
<td>2 (2.4%)</td>
</tr>
<tr>
<td>Transition Year enjoys a high level of public support (n = 86)</td>
<td>11 (12.8%)</td>
<td>28 (32.6%)</td>
<td>34 (39.5%)</td>
<td>12 (14.0%)</td>
<td>1 (1.2%)</td>
</tr>
<tr>
<td>Transition Year caters for students/learners of all abilities (n = 87)</td>
<td>21 (24.1%)</td>
<td>41 (47.1%)</td>
<td>16 (18.4%)</td>
<td>9 (10.3%)</td>
<td>0 (0.0%)</td>
</tr>
</tbody>
</table>

95.4% of teachers (n = 83) believe that Transition Year is relevant to the world in which students live in today and to their life experiences. No teacher disagreed with this statement. No teacher, who responded, disagreed or strongly disagreed with the
statements that the ‘Transition Year is effective in promoting the health and wellbeing of student learners’ or that the ‘Transition Year promotes the development of personal and social skills in student learners’.

The majority of teacher also believed that the Transition Year achieves a good balance between ‘academic’ and ‘practical’ education. 71.3% of teachers (n = 62) either agreed or strongly agreed with this statement. 25.3% were unsure and 3.4% disagreed with it. Teachers were not as overwhelmingly positive in their belief that Transition Year uses teaching and learning methods appropriate to the needs of students/learners. Only 4.6% of teachers disagreed with this statement, but 27.8% were unsure. Just over half the respondents (54.1%, n = 46) believed that Transition Year uses a good range of assessment methods, while 17.04% either disagree or strongly disagree with this statement. Less than half the teachers felt that the Transition Year enjoys a high level of public support (45.4%, n = 39), with 15.0% (n = 13) disagreeing or strongly disagreeing with this statement. Many teachers (39.5%) are unsure whether the Transition Year Programme enjoys a high level of public support. A higher proportion of teachers (71.2%, n = 62) think that Transition Year caters for students/learners of all abilities, with only 10.2% disagreeing with this statement.

The researcher wished to achieve a realistic view of the teachers’ feelings and opinions of the role of Science in the Transition Year. It was decided that the best manner by which to achieve this was through a free response question. Overall the teachers were quite positive about the role of Science in the year with it being described as essential, “Essential even for those not considering a future in science as it will be their last formal reference. It’s very important that it’s a positive experience.”, and very important to the year “Vitally important, though I feel it doesn’t get the required support from the subject support service.” However, some were more sceptical, one teacher noted that it was a good opportunity to allow the pupils to experience all three Science subjects, but “this never happens.” The full list of responses is available in Appendix H.

Teachers were also asked to indicate their beliefs on whether the Transition Year encouraged pupils to take Science at Leaving Certificate level. Overall, the teachers believed that taking Science during the year did encourage pupils to take up Science at Leaving Certificate. 83.8% of teachers (n = 67) believed that doing Science at
Chapter 6: Teacher Results

Transition Year can improve Science subject take up for the Leaving Certificate. Only 16.3% of teachers (n = 13) did not believe this. Overall the teachers in this sample view Science in Transition Year as an important part of the Transition Year experience and believe that it can be useful in improving the uptake of Science subjects.

6.2.3 Teaching Science in the Transition Year

Questions examined under the theme of ‘Teaching Science in the Transition Year’ were designed to allow the researcher an insight into what was being taught in Transition Year Science classes, and how this was accomplished. Figure 6.3 below indicates the frequency of practical work in the Transition Year Science classroom.

![Figure 6.3: Frequency of inclusion of practical work in Transition Year Science classes (n = 88)](chart)

Many teachers would include practical work in every double class (42.1%, n = 37), but, as discussed in chapter 7, not all teachers have a double class every week. Unfortunately this is still less than half of the respondents. Only 11.4% of teachers (n = 10) would include practical work in all of their Transition Year Science classes.
5.7% (n = 5) would not include practical work ever. These results indicate that some teachers are teaching contrary to the Transition Year guidelines, where active work and practical work is very much encouraged (Department of Education 1993c).

A high proportion of teachers claimed to teach from the Leaving Certificate Science syllabi (66.3%, n = 55). Figure 6.4 below indicates what Leaving Certificate Science syllabi are being taught by the teachers in their Transition Year Science classes.

A large proportion (66.3%, n = 55) of teachers are teaching from one or more of the Leaving Certificate Science syllabi in their Transition Year Science classroom. To do so is in violation of the Transition Year Guidelines and against the Inspectorate’s evaluation of the Transition Year Programme. (Government of Ireland 1993)

Teachers (n = 55) indicated that they teach from these courses for a variety of reasons. 38.2% (n = 21) do this in order to give pupils a taste of what is involved in the Leaving Certificate courses. Others do so in order to reduce their work load for 5th and 6th year (12.7%, n = 7). Some teachers are under pressure from parents and principals (3.64%, n = 2) and others just don’t know what else to do (1.82%, n = 1)
or they feel that the Leaving Certificate course is relevant and interesting (10.9%, n = 6).

Those who do not teach from the Leaving Certificate Science courses use a wide variety of interesting and innovative modules and methods, allowing students to experience Science in a relevant way. These methods also give students the opportunity to experience Science in a way in which they have not ‘heretofore encountered’ (Department of Education 1993c). This may have the effect of raising students’ interest and attitude levels towards Science from the low ebb they are at after the Junior Certificate (Department of Education and Science 2002). The full list of teachers’ responses as to why they teach from the Leaving Certificate Science syllabi and what they teach, if not teaching from the Leaving Certificate course, are given in Appendix H.

6.2.4 Teaching approaches utilised in the Transition Year Science classroom

Teachers utilised a wide variety of approaches in their delivery of their Transition Year Science classes. Despite mainly teaching from the Leaving Certificate Science syllabi, most teachers surveyed (72.4%, n = 63) would consider that they include more active learning in their Transition Year Science classes than in their other classes.

Figure 6.5 below, indicates what teaching approaches were utilised by the Transition Year science teachers, and the proportion of them that did not utilise any of these approaches.
Teachers’ vary in their use of recommended teaching styles and approaches (Second Level Support Service 2006). Teachers’ use of these approaches is as follows: the approaches which most teachers used were Active learning (87.5%, n = 77), Group work (87.5%, n = 77), Project work and research (80.7%, n = 71), Showing DVDs to reinforce material being taught (84.1%, n = 74), Use of computers (80.7%, n = 71), Showing PowerPoint slides to reinforce what is being taught (62.5%, n = 55), Discussion, debate, oral presentations, interview and role play (57.9%, n = 51). However, approaches such as having visiting speakers and seminars (51.1%, n = 45), using team teaching (30.7%, n = 27), and having the pupils take personal responsibility in their learning/self directed learning (30.7%, n = 27) were not as common.

Figure 6.5: Teaching approaches utilised in the Transition Year Science classroom (n = 88).
6.2.5 Activities in Transition Year Science

Questions analysed under the heading ‘Activities in Transition Year Science’ were designed to give a picture of the type of activities Transition Year Science teachers (n = 82) were involving their pupils in. Nearly three quarters of teachers (70.7%, n = 58) brought their pupils on educational Science trips.

As Figure 6.6 indicates, teachers bring their classes on educational trips to a wide variety of places. Teachers who responded ‘other’ indicated that they would bring their pupils to places such as local habitats, Science lectures, Armagh planetarium, and University events.

When teachers (n = 84) were asked if they would send their pupils to the BT Young Scientist and Technology Competition only 58.3% (n = 49) of teachers indicated that they would send their pupils to the competition.
6.2.6 Limitations to teaching Science in the Transition Year

The author believed that it was important to explore teachers’ perceived limitations to their pupils’ experiences of Transition Year Science. Figure 6.7 below illustrates the limitations that teachers felt hindered their pupils’ experience of Science in the year.

![Figure 6.7: Limitations to pupils’ experiences of Science in the Transition Year.](image)

Teachers agreed that there were some limiting factors in their pupils’ Transition Year Science experience. 39.1% (n = 34) believed that the facilities and equipment available to them in their school for their Transition Year Science classes limited their pupils’ experiences of Science. Over half the respondents (54.5%, n = 48) felt that the time constraints imposed upon them by the school was a limiting factor. Very few (25.3%, n = 20) believed that content presentation was restrictive to them, while just under half (48.8%, n = 41) felt that the availability of resources was an issue. Nearly all teachers (98.9%, n = 87) had access to a laboratory for at least one of these periods. Only 1.1% of teachers (n = 1) found laboratory access to be problematic, not having access for at least 1 period per week. The main limitation felt by all teachers was their Transition Year Science pupils being absent due to other school activities, with 78.3% (n = 61) of teachers indicating that this was a limiting
factor in their pupils’ experiences of Transition Year Science. One teacher noted that “on average only have 6 sessions approx (due to other activities) from timetabled 16”

Therefore, the main limitation on the Transition Year Science experience is that teachers do not have enough time with their pupils. This may be due to a lack of emphasis being placed upon the Sciences in the Transition Year, although it may affect other subjects as well.

### 6.2.7 Transition Year Science resources

A key purpose of Phase 1 of this study was also to examine what resources, if any, Transition Year Science teachers were using. Questions examining what University of Limerick ‘TY Science’ modules and PharmaChemical Ireland Transition Year Science resources teachers are using were included. Figures 6.8 and 6.9 indicate that a low proportion of the respondents were using these resources.
42.0% of teachers (n = 37) who responded to the questionnaire had used the University of Limericks’ ‘TY Science’ modules. The most popular University of Limerick ‘TY Science’ Resources in the Transition Year were the Forensic Science (81.1%, n = 28) and Cosmetic Science (45.9%, n = 17) modules. The Science of Sport module was also popular with 21.6% of teachers (n = 8) indicating that they had used this module.
20.5% of teachers (n = 15) who responded to the general teacher questionnaire had used PharmaChemical Ireland’s Transition Year Science resources. 66.7% of these teachers had used the Forensic Science resource (n = 10), and 40.0% (n = 6) had used the Cosmetic Science resource, with lower numbers having used the Microbiology (30.0%, n = 5), Environmental (6.7%, n = 1), and Sport (13.3%, n = 2) resources.

It was not only important to investigate what resources Transition Year Science teachers are using, but to also ask what type of resources are they looking for.

Figure 6.10 illustrates the type of resources that Science teachers are looking for in their Transition Year Science classes.
The majority of teachers would like resources in the format of Teacher guides (n = 47), PowerPoint Presentations (n = 43), Student handbooks (n = 40) and Interactive Media (n = 39). Fewer teachers were looking for websites (n = 27) or books (n = 12). Teachers wanted to receive their resources in a variety of manners. Figure 6.11 below identifies the various ways that teachers would like to receive their resources.
The majority of teachers indicated that they would prefer resources to be supplied in printed form (84.9%, n = 73). The next most popular format was in CD ROM, which 77.9% of teachers (n = 63) indicated that they would like. 40.7% of teachers (n = 35) indicated that they would like to receive a Transition Year Science resource in a form downloadable from the web. However, as clearly indicated in Figure 6.11, most teachers (82.6%, n = 71) noted that they would like the resources in a variety of formats.

Teachers (n = 81) were asked to respond to a question asking whether they were using any published resources, other than those listed in the questionnaire, only 45.7% (n = 37) of teachers were using any other published resources.

### 6.2.8 Summary of results from teacher questionnaire (Phase 1)

The key findings will be outlined in this section, and discussed further in Chapter 8. The Transition Year is taught by more experienced teachers, typically with more than 5 years experience, and over 60% have more than 10 years experience. Teachers display positive attitudes towards the Transition Year, but are unsure about the level of public support the year receives and the assessment methods used in the year.
role of Science within the Transition Year is highly regarded among teachers, who view it as important. They believe that Science in the year encourages uptake of Science subjects at senior cycle. Over two thirds of teachers teach from the Leaving Certificate Science syllabi in their Transition Year Science classes. Practical work is a regular feature of Transition Year Science and teachers use more active learning methods than in their other classes, however they tend to use traditional teaching and learning approaches. School Science-related trips are encouraged and carried out by over three-quarters of teachers. Teachers noted that there were limitations such as pupil absenteeism, lack of resources, lack of time and facilities and equipment in some cases, which hindered their teaching of Transition Year Science.

6.3 Results from the teacher questionnaires ~ Phase 2

6.3.1 Introduction to Teacher Questionnaires ~ Phase 2

This section of this chapter presents the findings from the teacher questionnaire used in Phase 2 of this study. The teachers involved in this phase were sampled more carefully than those in Phase 1, and can be considered to be more representative of Irish second level schools offering the Transition Year programme. A sample of 135 schools were contacted with the teacher questionnaire, and a response rate of 59.3% (N = 80) was achieved. Methods of sampling are discussed more fully in Chapter 4.

6.3.2 Teacher profile

The teachers surveyed (n = 80) comprised of 30.8% male teachers and 69.2% females. Once again, this is considered representative of Irish second level teachers.
Figure 6.12 indicates that the more experienced teachers tend to teach Transition Year Science, with 78.5% (n = 72) having over five years experience in teaching Science. These findings are similar to those in presented in section 6.1 of this chapter.

Teachers were also asked to indicate the type of school that they are teaching in.

Table 6.3: Breakdown of school by type and gender (n = 63).

<table>
<thead>
<tr>
<th></th>
<th>Secondary school</th>
<th>Vocational school</th>
<th>Community and Comprehensive school</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No. of teachers</td>
<td>No. of teachers</td>
<td>No. of teachers (%)</td>
</tr>
<tr>
<td></td>
<td>(%)</td>
<td>(%)</td>
<td></td>
</tr>
<tr>
<td>Single sex male</td>
<td>13 (20.6%)</td>
<td>0</td>
<td>11 (17.5%)</td>
</tr>
<tr>
<td>Single sex female</td>
<td>12 (19.0%)</td>
<td>0</td>
<td>16 (25.4%)</td>
</tr>
<tr>
<td>Coeducational</td>
<td>11 (17.5%)</td>
<td>16 (25.4%)</td>
<td>10 (15.9%)</td>
</tr>
</tbody>
</table>
Table 6.3, indicates that there were no single-sex vocational schools in the sample, and that coeducational vocational schools made up the greatest proportion of the sample.

Table 6.4 gives a summary of the qualifications that have either been obtained by the teachers in this sample, and those that are currently being pursued.

<table>
<thead>
<tr>
<th>Qualification</th>
<th>Obtained Number of Teachers (%)</th>
<th>Currently pursuing Number of Teachers (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bachelor’s degree (B.A., B.Sc., etc.) (n = 79)</td>
<td>78 (98.7%)</td>
<td>1 (1.3%)</td>
</tr>
<tr>
<td>Higher Diploma (n = 63)</td>
<td>63 (98.4%)</td>
<td>0 (0.0%)</td>
</tr>
<tr>
<td>Graduate Diploma (n = 17)</td>
<td>15 (88.2%)</td>
<td>2 (11.8%)</td>
</tr>
<tr>
<td>Master’s degree (n = 20)</td>
<td>14 (70%)</td>
<td>6 (30.0%)</td>
</tr>
<tr>
<td>Ph.D. (n = 0)</td>
<td>0 (98.7%)</td>
<td>0 (0.0%)</td>
</tr>
<tr>
<td>Ed.D. (n = 3)</td>
<td>3 (100%)</td>
<td>0 (0.0%)</td>
</tr>
</tbody>
</table>

It is clearly illustrated in Table 6.4, that the vast majority of teachers in this sample have obtained a Bachelor’s degree. While 63 teachers have obtained a Higher Diploma in Education, the remaining teachers in the sample (n = 17) have a B.Sc. (Ed.) degree, through the concurrent model of teacher training: this does not require the individual to pursue a further qualification in Education to teach. The breakdown of the types of degrees obtained by teachers is illustrated in Figure 6.13 below.
Figure 6.13: Breakdown of the type of degree received (or being currently pursued) by Transition Year Science teachers (n = 79).

The majority of teachers have a Bachelor of Science degree (n = 53), while one teacher has both a Bachelor of Science and a Bachelor of Arts degree.

The main subjects studied in teachers’ degrees are depicted in Figure 6.14 below. Figure 6.14 illustrates that the majority of teachers (69.3%, n = 52) have studied the Physical Sciences either by themselves (17.3%, n = 13) or combined with another subject (52.0%, n = 39)
The Biological Sciences were studied by 56.0% of teachers (n = 42), whether alone (24.0%, n = 18) or combined with other subjects (32.0%, n = 24).

30.7% of teachers (n = 24) had Mathematics as a component of their degree along with other subjects, with only one teacher (1.3%) having the subject as the main subject in their degree.

Figure 6.15 summarises the institutions that awarded the teachers’ with their degrees.
Degrees were awarded by a wide variety of institutions in both Ireland and the UK. The majority of teachers (31.1%, n = 23) did their degrees in National University of Ireland, Galway, followed by the University of Limerick (24.3%, n = 18). Table 6.5 summarises the subjects that Transition Year Science teachers are qualified to teach and those that they are currently teaching.
Table 6.5: Breakdown of the subjects that teachers are qualified to teach and the subjects that they are currently teaching.

<table>
<thead>
<tr>
<th>Cycle</th>
<th>Subjects teachers are qualified to teach</th>
<th>Subjects teachers are currently teaching</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Science (n = 79, 98.8%)</td>
<td>Physics (n = 27, 33.8%)</td>
</tr>
<tr>
<td>Subjects</td>
<td>Maths (n = 54 67.5 %)</td>
<td>Chemistry (n = 48, 60.0%)</td>
</tr>
<tr>
<td></td>
<td>Biology (n = 56 70.0%)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ag Science (n = 22, 27.5%)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Physics &amp; Chemistry (n = 12 15.0%)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Maths (n = 36, 45.0%)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Applied Maths (n = 12, 15.0%)</td>
<td></td>
</tr>
</tbody>
</table>

Teachers are, in general, qualified to teach Junior Certificate Science. However, despite the high proportion of teachers who stated that their main degree subjects were the physical sciences, few are qualified to teach Physics. 5.14% (n = 4) teachers are unqualified to teach Leaving Certificate Physics, yet are currently doing so, this is also true for Mathematics, to an even greater extent: 10.3% of teachers (n = 8) are unqualified to teach Leaving Certificate Mathematics and 6.41% (n = 5) are unqualified to teach Junior Certificate Mathematics and, yet are currently doing so. Agricultural Science (1.3%, n = 1) also experiences this, but to a lesser extent. Out-of-field teaching does not appear for Junior Certificate Science, or the other Leaving Certificate Science and Mathematics subjects.
6.3.3 Teachers’ attitudes and beliefs regarding Transition Year Science

This theme explores the teachers’ attitudes and beliefs towards Transition Year Science. These results are presented in this section.

![Bar chart showing teachers' beliefs on the importance of science in the Transition Year](chart)

Figure 6.16: Teachers’ beliefs on the importance of science in the Transition Year (n = 76).

Teachers mainly believe that Science is quite important in the Transition Year, with 80.3% (n = 61) rating it as important or very important. Only 5.3% of teachers (n = 4) believed that Science was of little importance in the year. Chi-square testing was performed in order to assess whether there were any significant relationships between teachers’ views on the importance of Science in the Transition Year and the teachers’ gender, their length of time teaching science, their main subjects and whether or not they teach from the Leaving Certificate Science syllabi in the Transition Year. No significant values were noted (p > 0.05) for any of these tests, though it was noted that female teachers believed that Science in the year was more important than male teachers, with 82.4% choosing important or very important (n =
42) and 75.0% (n = 18) of male teachers choosing this option. Slightly more teachers who did not teach from the Leaving Certificate Science syllabi in the Transition Year believed Science was either important or very important in the Transition Year (84.0%, n = 21), when compared to those who do teach from the Leaving Certificate Science syllabi (78.4%, n = 40). These differences were not significant.

Figure 6.17 illustrates the teachers’ opinions on the effect of Transition Year science on the pupils’ choice of subjects at Leaving Certificate and their performance at Leaving Certificate.

![Attitudes to the effect of Transition Year Science on pupils](image)

Figure 6.17: Transition Year Science teachers’ opinions on the effect of Transition Year Science on pupils.

Teachers (86.7%, n = 65) believe that taking Science in the Transition Year does encourage the uptake of the science subjects at Leaving Certificate. They also believe that taking Science in the Transition Year can influence the pupils’ choice of subjects for Leaving Certificate (86.5%, n = 64). However, whether taking Science in the Transition Year affects pupils’ performance gives a more mixed response. The majority of teachers (60.3%, n = 44) believe that Science in the Transition Year does affect the pupils’ performance in the Sciences at Leaving Certificate, but a sizable proportion (39.7%, n = 29) believe that it does not.
Chi-square testing was performed in order to assess whether there were any significant correlations between teachers’ attitudes on the effect of taking Science in the Transition Year on pupils and the teachers’ gender, their length of time teaching science, their main subjects and whether or not they teach from the Leaving Certificate Science syllabi in the Transition Year. No significant values were noted (p > 0.05) for any of these tests.

6.3.4 Teaching Science in the Transition Year

The results presented under the theme of teaching science in the Transition Year are presented and discussed in this section of the chapter. This theme investigates what is taught in Transition Year Science and why these various topics are taught. Figure 6.18 examines the percentage of teachers who teach from the Leaving Certificate Science syllabi in their Transition Year Science class. A high proportion of teachers (67.9%, n = 53) are teaching from the Leaving Certificate Science syllabi. This percentage of teachers very similar to that reported in Phase 1 of this study. Teaching directly from the Leaving Certificate syllabi in the Transition Year is in direct contravention of the Transition Year guidelines (Government of Ireland 1993), but it is clearly a widely established practice.
When these figures were compared with teachers’ gender, through Chi-square testing, significant values were found ($\chi^2 (1) = 5.763, p = 0.016$): 50.0% of male teachers (n = 12) teach from the Leaving Certificate Science syllabi in the Transition Year compared to 77.4% (n = 41) of female teachers. Correlations examining whether or not teachers teach from the Leaving Certificate Science syllabi against their length of time teaching and their level of preparedness indicated that these two factors were not significant.

The areas of the Leaving Certificate Science syllabi that teachers are teaching were examined, and these results are illustrated in Figure 6.19.
Figure 6.19: Specific Leaving Certificate Science syllabi taught in the Transition Year Science classroom (n = 78).

As indicated in Figure 6.19, all three main Leaving Certificate Science subjects are taught in the Transition Year (19.2%, n = 15). The most commonly Leaving Certificate subject taught is Biology (19.2%, n = 15), followed by Chemistry (7.69%, n = 6).

When all teachers who teach Leaving Certificate Biology in the Transition Year Science classroom are taken into account, results indicate that just over half the cohort (n = 40, 51.3%) teach this syllabus in Transition Year.

The frequency with which the Leaving Certificate Science syllabi are taught in the Transition Year varies, as indicated in Figure 6.20.
The majority of respondents (76.5%, n = 52) teach from the Leaving Certificate Sciences syllabi very frequently, frequently and occasionally. Chi-square and Mann-Whitney testing indicates that there are no significant factors linking to how often teachers teach from the Leaving Certificate Science syllabi.

Having explored what Leaving Certificate Science syllabi teachers teach from and how frequently they teach from these it is interesting to examine why they teach from these courses, when it is explicitly against the guidelines of the Transition Year Programme (Department of Education and Science 1993). Figure 6.21 illustrates the various reasons why teachers teach from these syllabi in the Transition Year.
The main reason for teachers teaching from the Leaving Certificate Science syllabi in the Transition Year is to give the pupils a taste of what the Leaving Certificate Science courses would be like (82.5%, n = 52). Few teachers (19.4%, n = 12) do so in order to reduce the pupils workload for the Leaving Certificate, and even fewer do so because of a lack of resources (17.7%, n = 11).

In the free response question associated with this question teachers noted that their main reasons for teaching from the Leaving Certificate Science courses were to give pupils a better idea of what the courses were like before making a decision “Some students pick LC Physics/Chemistry based on the ‘fun’ experiments in TY so we try to give an idea of the topic in LC”, other reasons noted were because the courses contained nice practical work, and some teachers did not have enough time to come up with alternatives.
Figure 6.22: Breakdown of whether Transition Year Science teachers teach from the Leaving Certificate Science syllabi by the teachers’ subject area.

Figure 6.22 illustrates that Physics teachers teach the least from the Leaving Certificate Science syllabi in their Transition Year Science classes. Teachers were also asked what other areas of Science they taught in the Transition Year and this indicated that there was plenty of variety of Science topics throughout the year. Teachers were doing various ‘fun’ topics and modules ranging from forensic science (“Forensic Science – which includes aspects of Leaving Certificate Chemistry such as flame tests – tests for anions, chromatographs, etc.”) to kite building (“Tend to do projects – building a kite, catapult etc.”). A full list of teachers’ responses to this question is given in Appendix I.

Teachers were asked to indicate how often they would include practical work in their Transition Year Science classes, these results are summarised in Figure 6.23 below.
Figure 6.23: The frequency of practical work in the Transition Year Science classroom (n = 77).

The majority of teachers (71.4%, n = 55) would include practical work in the Transition Year Science class at least every week. However, there are still 28.6% (n = 22) of teachers who would not include practical work at least once a week in their Transition Year Science class. Figure 6.24 below indicates that perhaps laboratory access may be a contributing factor to the frequency with which practical work is carried out. This is not deemed to be a significant factor (p = 0.053), but nonetheless, a trend is noted in Figure 6.24 below.
Figure 6.24: Frequency of practical work in Transition Year Science class compared with frequency of laboratory access (1 = Every class, 2 = Every double class, 3 = Every week, 4 = Every second week, 5 = Other).

6.3.5 Teaching approaches in Transition Year Science

The various teaching and learning approaches and activities utilised by teachers when teaching Transition Year Science are presented in Table 6.6.
Table 6.6: Teaching and learning activities utilised in Transition Year Science classes.

<table>
<thead>
<tr>
<th>Statement</th>
<th>Very Frequently No. of teachers (%)</th>
<th>Frequently No. of teachers (%)</th>
<th>Occasionally No. of teachers (%)</th>
<th>Rarely No. of teachers (%)</th>
<th>Very Rarely No. of teachers (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Activity-based learning (n = 77)</td>
<td>34 (44.2%)</td>
<td>31 (40.3%)</td>
<td>8 (10.4%)</td>
<td>4 (5.2%)</td>
<td>0 (0.0%)</td>
</tr>
<tr>
<td>Team teaching (n = 71)</td>
<td>6 (8.5%)</td>
<td>6 (8.5%)</td>
<td>18 (25.4%)</td>
<td>11 (15.5%)</td>
<td>30 (42.3%)</td>
</tr>
<tr>
<td>Group-work (n = 76)</td>
<td>29 (38.2%)</td>
<td>33 (43.4%)</td>
<td>12 (15.8%)</td>
<td>1 (1.3%)</td>
<td>1 (1.3%)</td>
</tr>
<tr>
<td>Class Discussion (n = 74)</td>
<td>22 (29.7%)</td>
<td>30 (40.5%)</td>
<td>14 (18.9%)</td>
<td>6 (8.1%)</td>
<td>2 (2.7%)</td>
</tr>
<tr>
<td>Class/Group debate (n = 71)</td>
<td>8 (11.3%)</td>
<td>7 (9.9%)</td>
<td>26 (36.6%)</td>
<td>15 (21.1%)</td>
<td>15 (21.1%)</td>
</tr>
<tr>
<td>Oral presentations (n = 76)</td>
<td>11 (14.5%)</td>
<td>26 (34.2%)</td>
<td>23 (30.3%)</td>
<td>8 (10.5%)</td>
<td>8 (10.5%)</td>
</tr>
<tr>
<td>Interviews (n = 69)</td>
<td>0 (0.0%)</td>
<td>1 (1.4%)</td>
<td>8 (11.6%)</td>
<td>22 (31.9%)</td>
<td>38 (55.1%)</td>
</tr>
<tr>
<td>Role play (n = 75)</td>
<td>1 (1.3%)</td>
<td>4 (5.3%)</td>
<td>8 (10.7%)</td>
<td>20 (26.7%)</td>
<td>42 (56.0%)</td>
</tr>
<tr>
<td>Personal responsibility in learning/</td>
<td>13 (18.3%)</td>
<td>22 (31.0%)</td>
<td>23 (32.4%)</td>
<td>7 (9.9%)</td>
<td>6 (8.5%)</td>
</tr>
<tr>
<td>Self directed learning (n = 71)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Project work and research (n = 76)</td>
<td>23 (30.3%)</td>
<td>27 (35.5%)</td>
<td>23 (30.3%)</td>
<td>1 (1.3%)</td>
<td>2 (2.6%)</td>
</tr>
<tr>
<td>Visiting speakers (n = 74)</td>
<td>7 (9.5%)</td>
<td>11 (14.9%)</td>
<td>25 (33.8%)</td>
<td>13 (17.6%)</td>
<td>18 (24.3%)</td>
</tr>
<tr>
<td>Seminars (n = 69)</td>
<td>3 (4.3%)</td>
<td>6 (8.7%)</td>
<td>10 (14.5%)</td>
<td>19 (27.5%)</td>
<td>31 (44.9%)</td>
</tr>
<tr>
<td>Use of computers (n = 74)</td>
<td>17 (23.0%)</td>
<td>31 (41.9%)</td>
<td>17 (23.0%)</td>
<td>4 (5.4%)</td>
<td>5 (6.8%)</td>
</tr>
<tr>
<td>Showing DVDs/videos (n = 75)</td>
<td>8 (10.7%)</td>
<td>27 (36.0%)</td>
<td>29 (38.7%)</td>
<td>27 (36.0%)</td>
<td>19 (25.3%)</td>
</tr>
<tr>
<td>PowerPoint slide shows (n = 75)</td>
<td>22 (29.3%)</td>
<td>22 (29.3%)</td>
<td>12 (15.8%)</td>
<td>4 (5.3%)</td>
<td>3 (4.0%)</td>
</tr>
<tr>
<td>Carry out practical work (n = 76)</td>
<td>39 (51.3%)</td>
<td>16 (22.5%)</td>
<td>23 (32.4%)</td>
<td>12 (16.9%)</td>
<td>16 (22.5%)</td>
</tr>
<tr>
<td>Enter Science competitions e.g. SciFest etc.</td>
<td>4 (5.6%)</td>
<td>12 (16.9%)</td>
<td>3 (3.9%)</td>
<td>0 (0.0%)</td>
<td>16 (22.5%)</td>
</tr>
</tbody>
</table>

Teachers use activities such as activity-based learning (84.5%, n = 65), Group work (81.6%, n = 62), Carrying out practical work (80.2 %, n = 61), Class discussion
Project work and research (65.8%, n = 50), PowerPoint slide shows (65.3%, n = 49), and use of computers (64.9%, n = 48) either very frequently or frequently. However, activities such as Team teaching (57.8%, n = 41), Class or group debates (42.2%, n = 30), Role play (82.7%, n = 62), having seminars (72.4%, n = 50), visiting speakers (41.9%, n = 31), or taking entering Science competitions (39.4%, n = 28) are rarely or very rarely included as part of the Transition Year Science programme.

### 6.3.6 Preparedness to teach Science in the Transition Year

Teacher preparedness to teach Transition Year science examines the training and preparation that teachers have received both in their pre-service and in-service courses. Figure 6.24 indicates the lack of pre-service training teachers received.

![Figure 6.25: Teachers’ opinions on whether they received adequate pre-service training to teach/design their own curriculum in Transition Year (n = 77).](image)

Nearly three quarters of teachers (n = 57) believed that they did not receive adequate pre-service training to teach or design their own curriculum for their Transition Year Science class. No trends were noted for the teachers’ length of time teaching when compared with the pre-service training they received.
Teachers (69.3%, n = 52) did not believe that in-service training was provided for Transition Year Science and few teachers (33.8%, n = 26) had ever attended any in-service training for Transition Year Science. Chi-square testing indicated that there is a correlation ($\chi^2 (4) = 9.429, p = 0.047$) between the length of time that teachers have been teaching and whether they have attended in-service training for Transition Year Science, with teachers who have been teaching longer less likely to have attended this training. This can be seen more clearly in Figure 6.26.

![Figure 6.26: Breakdown of whether teachers have ever attended an in-service in the area of Transition Year Science by their length of time teaching.](image)

However, nearly all respondents (n = 75) agreed (90.7%, n = 68) that there needs to be more in-service training in Transition Year Science. The vast majority of these teachers (93.3%, n = 70) said that if there were more in-service courses provided for Transition Year Science, that they would attend.

Despite this apparent lack of specific training in the area of Transition Year Science, teachers are relatively confident in their ability to design a Science curriculum for their Transition Year Science class, as illustrated in Figure 6.27 below.
Kruskal-Wallis tests indicated that this level of confidence was significantly ($H(4) = 12.3$, $p = 0.015$) related to the teachers’ length of time teaching Science, with teachers who had been teaching for 5-10 years displaying the highest level of confidence, followed closely by teachers teaching for 15+ years. Those teaching for 10-15 years experienced the lowest levels of confidence. More recently qualified teachers had average levels of confidence towards designing a Science curriculum for their Transition Year Science class. No significant correlations were found between the teachers’ levels of confidence and whether they teach from the Leaving Certificate Science syllabi.

Teachers ($n = 71$) did find the Transition Year Second Level Support Service (now known as the PDST) to be helpful (62.0%, $n = 44$) in relation to Science.
6.3.7 Transition Year Science resources

This section of the chapter examines where teachers find resources for the teaching of Transition Year Science, which resources they are using and their attitude towards resources for Transition Year Science.

Figure 6.28 below presents the various sources of Transition Year Science resources for teachers.

![Figure 6.28: Breakdown of where Transition Year Science teachers source resources for their Science classes.](image)

The majority of teachers (47.4%, n = 36) find their resources through the Second Level Support Service (SLSS, now known as the PDST). Teachers also noted that they found resources on the internet (n = 22) and through the Institute of Physics (n = 2).

The main resources in use or previously used by teachers for their Transition Year Science classes were UL’s ‘TY Science’ modules (42.5%, n = 31), and PharmaChemical Ireland’s Transition Year Science resources (19.2%, n = 14). These results are illustrated in Figure 6.29.
Figure: 6.29: Breakdown of what Transition Year Science resources teachers are using.

Few (9.6%, n = 7) were using the NCCA’s Transition Year Units. A number of teachers (n = 26) used no resources in the Transition Year.

Teachers’ attitudes and beliefs regarding Transition Year Science resources are presented in Table 6.7.
Table 6.7: Transition Year Science teachers’ attitudes towards resources for Transition Year Science.

<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly Agree No. of teachers (%)</th>
<th>Agree No. of teachers (%)</th>
<th>Undecided No. of teachers (%)</th>
<th>Disagree No. of teachers (%)</th>
<th>Strongly Disagree No. of teachers (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>The resources available to Transition Year Science teachers are of good quality. (n = 76)</td>
<td>3 (3.9%)</td>
<td>32 (42.1%)</td>
<td>29 (38.2%)</td>
<td>7 (9.2%)</td>
<td>5 (6.6%)</td>
</tr>
<tr>
<td>Transition Year Science has usable resources available to teachers. (n = 73)</td>
<td>2 (2.7%)</td>
<td>39 (53.4%)</td>
<td>18 (24.7%)</td>
<td>10 (13.7%)</td>
<td>4 (5.5%)</td>
</tr>
<tr>
<td>Good resources make for better Science lessons (n = 76)</td>
<td>52 (68.4%)</td>
<td>23 (30.3%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>1 (1.3%)</td>
</tr>
<tr>
<td>Transition Year Science resources are easily available and accessible. (n = 76)</td>
<td>1 (1.3%)</td>
<td>21 (27.6%)</td>
<td>19 (25.0%)</td>
<td>27 (35.5%)</td>
<td>8 (10.5%)</td>
</tr>
</tbody>
</table>

Teachers are quite neutral towards the resources for Transition Year Science. However, teachers strongly agreed and agreed (98.7%, n = 75) that ‘good resources make for better Science lessons’. Teachers also erred towards the positive when ranking their agreement with the statement that ‘Transition Year has usable resources available to teachers’, with 56.1% of teachers (n = 41) agreeing or strongly agreeing with the statement. Mann-Whitney testing (U = 337.0, p = 0.008, r = -0.31) indicated
that teachers who felt that they received adequate pre-service training were significantly more in agreement with the statement that ‘Transition Year Science resources are easily available and accessible’.

6.3.8 Summary of section

The main findings from the teacher questionnaires conducted in Phase 2 of this study are presented here. Similarly to the findings from the teacher questionnaire carried out in Phase 1, experienced teachers tend to teach Transition Year Science, with over 60% having taught for more than 10 years. Almost all teachers are qualified to teach Science, and over half the teachers surveyed had Biological Sciences as a component of their degree. Teachers believe that Transition Year Science is very important, although this is truer for female teachers than for male teachers, and teachers who do not teach from the Leaving Certificate Science syllabi. Teachers also believe that Transition Year Science can encourage pupils’ uptake of Science subjects at Leaving Certificate. A slight majority of teachers believe that Transition Year Science can enhance pupils’ performance at Leaving Certificate level. Over two-thirds of teachers teach from the Leaving Certificate Science syllabi, and they do this for a variety of reasons, primarily to give a subject taster, to reduce the workload for senior cycle and due to a lack of resources. Transition Year Science teachers place a strong emphasis on practical work and bring it into their classrooms frequently. However, the Transition year Science teachers tend to teach in a conventional fashion, with little collaboration or innovative methods. The author proposes that this is due to the lack of pre-service and in-service training that Transition Year Science teachers claim to have. However, the teachers’ confidence in their ability to design their own syllabus for their Transition Year Science class is linked to their length of time teaching, and thus their experience. These findings will be explored further in the context of the research questions in Chapter 8.
6.4 Results of Interviews with Transition Year Science teachers

The semi-structured interviews were guided by seven sections, which are outlined below:

- Teacher background and profile
- Teacher attitudes and beliefs regarding Transition Year Science
- Teaching Science in the Transition Year
- Activities in Transition Year Science
- Limitations to teaching Science in the Transition Year
- Preparedness to teach Science in the Transition Year
- Transition Year Science resources

The interview schedule guided the interviews that took place, each of which lasted approximately 20-30 minutes. Teachers are referred to numerically (i.e. Teacher 1), with the number that each teacher has been assigned corresponding to the number of the case study school in which they were teaching. Interviews were transcribed using Microsoft Word (all the transcribed interviews are provided in Appendix J) and NVivo, version 8, was used to facilitate the analysis of the transcripts. After a careful analysis of the interview transcripts, themes emerged under the sections given above, and these themes were categorised into nodes, using manual interpretative coding.

Each of the seven sections presented under the heading of qualitative results will focus on the views, attitudes and opinions of the seven Transition Year Science teachers interviewed. Attention will also be paid to what, why and how the teachers are teaching in Transition Year Science.
6.4.1 Teacher profile

One teacher from each of the 7 case study schools was interviewed. All of these teachers were teaching Transition Year Science at the time.

<table>
<thead>
<tr>
<th>Teacher</th>
<th>Gender</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teacher 1</td>
<td>Female</td>
</tr>
<tr>
<td>Teacher 2</td>
<td>Male</td>
</tr>
<tr>
<td>Teacher 3</td>
<td>Male</td>
</tr>
<tr>
<td>Teacher 4</td>
<td>Female</td>
</tr>
<tr>
<td>Teacher 5</td>
<td>Female</td>
</tr>
<tr>
<td>Teacher 6</td>
<td>Male</td>
</tr>
<tr>
<td>Teacher 7</td>
<td>Female</td>
</tr>
</tbody>
</table>

The teachers’ profiles were broken down further into four nodes: qualifications, length of time teaching Science, Science subjects currently teaching, and reasons for becoming Science teachers.

*Node: Teacher qualifications and length of time teaching Science*

All teachers interviewed had received their primary degree in an area of Science. The teachers’ degrees were many areas of Science: two teachers had their degrees in the Physical Sciences, while two other teachers did general or undenominated Science. The individual qualifications of the Science teachers are broken down in Table 6.9.
Table 6.9: Breakdown of interviewee Transition Year Science teachers’ qualifications (n = 7)

<table>
<thead>
<tr>
<th>Teacher</th>
<th>Degree</th>
<th>Awarding Body</th>
<th>Further Qualifications</th>
<th>Length of time teaching Science (years)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teacher 1</td>
<td>Zoology &amp; Botany</td>
<td>University College Dublin</td>
<td>Higher Diploma in Education</td>
<td>26</td>
</tr>
<tr>
<td>Teacher 2</td>
<td>Degree 1: Chemistry Degree 2: Physics and Applied Mathematics</td>
<td>Not given</td>
<td>Higher Diploma in Education</td>
<td>29</td>
</tr>
<tr>
<td>Teacher 3</td>
<td>Experimental Physics, Biology and Mathematics</td>
<td>National University of Ireland – Maynooth</td>
<td>Higher Diploma in Education</td>
<td>26</td>
</tr>
<tr>
<td>Teacher 4</td>
<td>Biochemistry</td>
<td>University College Cork</td>
<td>Higher Diploma in Education</td>
<td>13</td>
</tr>
<tr>
<td>Teacher 5</td>
<td>Undenominated Science - Chemistry</td>
<td>National University of Ireland – Galway</td>
<td>Higher Diploma in Education</td>
<td>5</td>
</tr>
<tr>
<td>Teacher 6</td>
<td>Degree 1: Chemistry Degree 2: Mathematics</td>
<td>University College Cork</td>
<td>Higher Diploma in Education Ph.D. in Chemistry</td>
<td>17</td>
</tr>
<tr>
<td>Teacher 7</td>
<td>General Science (Biology specialism)</td>
<td>Trinity College Dublin</td>
<td>None</td>
<td>12</td>
</tr>
</tbody>
</table>

Only one teacher (Teacher 7) had not qualified further and received a Higher Diploma in Education or equivalent; this teacher was actually employed as a laboratory technician in the school, but was teaching Transition Year Science.
“I’m a lab technician. I worked in a University and then I came back into school as a technician and then got my degree and started teaching part time”

(Teacher 7)

Another teacher (Teacher 6) was teaching for many years without a Higher Diploma in Education or equivalent.

“As I say I, I spent about two and a half years… subbing and doing a bit of part-time work over in Cashel… but ah, the reality was without the H.Dip. you couldn’t…”

(Teacher 6)

Two teachers (Teacher 2 and 6) had two primary degrees, which would be considered unusual for the profession. These degrees encompassed the Physical Sciences and Mathematics for both teachers. All teachers, except for Teacher 5, had considerable experience in teaching Science, and had been teaching the subject for well over ten years. Three teachers were approaching thirty years teaching.

**Node: Science subjects currently teaching**

The science subjects that teachers were currently teaching were explored in this node. Teacher 7 was only teaching Science in the Transition Year; in the main she taught Biology and Chemistry, but also taught Physics on occasion. As mentioned previously Teacher 7 is not qualified to teach, as she has no post graduate certification or training in education, but she is also not qualified to teach Chemistry or Physics, even in the Transition Year. Teacher 5 was also teaching outside her subject specialism, and was teaching Physics and Biology to Leaving Certificate level. All other teachers were teaching either general Science at Junior Certificate or one of their specialist subjects at Leaving Certificate, but two of the teachers (Teacher 4 and 5) were teaching Mathematics at either Junior Certificate or Leaving Certificate level, despite not being qualified to do so.
“Chemistry and Biology to Leaving Cert, and Junior Cert Science... and Maths. Am... currently teaching to Junior Cert ordinary.” (Teacher 4)

“Ammm, I teach Biology to Leaving Cert and Maths to Leaving Cert, I have to have Physics to Leaving Cert as well.”

(Teacher 5)

Therefore out of these Case Study teachers, two were teaching outside their subject specialism within the Science subjects, and two more (one was the same, Teacher 5) were teaching outside their subject specialism by teaching Mathematics.

**Node: Reasons for becoming a Science teacher**

The reasons behind the teachers’ decision to become a Science teacher were explored in this node. Four out of the seven teachers stated that they had not intended to become Science teachers, and appeared to have ‘fallen into’ the career through a variety of reasons.

“I suppose I kinda wandered into it really. I did a Science degree and then ... it was just automatic to do the Dip. I never... thought of myself as teaching, to be honest...I drifted that way. I was going to be a vet.”

(Teacher 1)

“I don’t think there was anything else available at the time really to be honest with you...I don’t think we... ‘twas a recession when I came out.”

(Teacher 2)
“I went into an area that was very new at the time, micro maintenance and repair. I spent a year at that and I just didn’t see a future in it for me. I suppose I just always had an inkling to go back and do a H. Dip. and I decided then after a year I’d go back to university again.”

(Teacher 3)

“’twas my intention to continue lecturing but, ah, I didn’t realise ’twas going to be very difficult to get a, a lecturing job am... and if I had a thousand euros for every interview I did for we’ll say lectureships in the... traditional Universities here and the institutes of technology I’d be a wealthy man, but the fact of the matter was that most of the interviews... in those days, there was people sitting in those jobs already and that, that, that was the... fact of the matter. But, ah, after a few months then, am... I said’ well, you have to put bread and butter on the table’ so I said I’d move into second level.”

(Teacher 6)

The other two teachers interviewed had always wanted to become teachers.

“Ammm it’s always what I wanted to do. Yeah, I didn’t ever want to do anything else, I just went the long way about doing it yeah.”

(Teacher 5)

“yes, straight into Science teaching.” (Teacher 4)

It is interesting to note that only two of the teachers interviewed mentioned that they had always aspired to become Science teachers, whereas for many others it was due to the economic climate at the time of graduation.
6.4.2 Teachers’ attitudes and beliefs regarding Transition Year Science

**Node: The Role of Science in the Transition Year**

It is of great importance to investigate the teachers’ opinions on the role of Science in the Transition Year, and these are examined in this node. Science in the Transition Year was viewed as ‘important’ and ‘essential’ by all of the teachers, but the reasons why some of the teachers believed this were quite different. Teachers 1 and 6 believed that it was a hugely important opportunity to ‘capture’ pupils, who otherwise may not have thought about studying Science for the Leaving Certificate.

“*Oh generally like it’s, it’s a big opportunity to capture them. You know to let them know… what… the, the various subjects are like and kind of I dunno I suppose impress them with it and get them interested.*”

(Teacher 1)

“*Oh I think that ’tis absolutely vital, as I say. Ah I mean if ’tis used properly ’tis, ’tis a powerful link between the, the Junior Cert and say the Senior Cycle and as I say I suspect that in the past that is one of the reasons why there has been a fall off.*”

(Teacher 6)

Teacher 4 believed that it was an opportunity to teach about topical, current and relevant issues in Science.
“I think it’s very, it’s an important opportunity to teach the students about some topical issues... as well as helping them choose subjects for their Leaving Cert... we, if there are Science things in the news......we might deal with that when the... the big scandal about the, the protein supplements or whatever it was they were throwing into the baby food in China... when that hit last year, or the year before we did a couple of lessons on that. So I think that... ah, Transition Year is a chance to sort of... I dunno, educate on topical issues.”

(Teacher 4)

Teacher 3 was not as emphatic as the others on this point and stated that the year was important, but noted that Science classes had been cut to make way for another subject.

“I suppose it’s important like you know we would always emphasise it, now I suppose one of the downsides is that in recent years like we’ve had an ECDL programme running here and we’ve had to take 5 classes so amm I remember at the time, we’d to decide on the timetable. We had 4 and we felt 4 wasn’t enough and we went to the principal and she said look where do you propose to take it, we had to take it off of Science went from 3 back to 2 for Science but amm, it’s, it’s, we view it as being an important subject that everyone must do you know.”

(Teacher 3)

Teacher 2 also viewed Science in the year as important, but this was due to the face that he did not feel that the Leaving Certificate Science courses, in the broad sense of what the syllabi required, could be covered in two years, and the Transition Year offered the opportunity of a three year Leaving Certificate course.
“Well I don’t think, I don’t think... what the aims they have for Science... in the syllabus is I don’t think you can... fulfil those aims in a two year course. I don’t think you can. I mean all you can do is get through the... the content in two years you know. To give the broader aims about... you know the whole scientific method like I said and scientific literacy... you’re not going to get that on the core... two year course you know, So I, I you know... it’s a huge, huge input I think.”

(Teacher 2)

Teacher 2 revealed that his school (School 2) use the Transition Year as an extra Leaving Certificate year for all subjects.

Overall, all of the teachers believed that Science was hugely important in the Transition Year. However, when these beliefs were probed further it was found that the rationale behind them was hugely different. Teachers varied from viewing the year as an important opportunity to teach relevant and current science, thus capturing the pupils, and others believing that it allowed the opportunity to teach a three year Leaving Certificate curriculum.

**Node: Subject specialists teaching Transition Year Science**

A further theme that arose through analysis under the heading of ‘Teachers’ attitudes and beliefs regarding Transition Year Science’ were the teachers’ attitudes to Science subjects being taught by a subject specialist teacher. Three of the teachers interviewed mentioned this during their interviews, and all believed that this was important in the Transition Year, in order to promote the uptake of Science subjects, and to allow access to pupils they may ordinarily not have during their time in the school.
“And I think obviously… you know teachers, you know like I love Biology so I kind of like doing the Biology part of transition year and I know Diane loves doing the Chemistry and the Physics people you know they love messing around with the electronics and everything. So Yeah, Yeah, it is… it is an opportunity for a teacher to get their own input into the, the subject rather than just the straight… syllabus for the Leaving Cert.”

(Teacher 1)

“Probably one of the failings of the Junior Cert is that… you have a lot of, say, biologists teaching Physics and Chemistry, and vice versa. And this is why, the way we do the Transition Year here is, is… very successful in terms of recruiting people to do Chemistry at Leaving Cert is because I get to spend a year with them, whenever I see them I might add because they’re in and out, but I get to spend a year with students that I might not have had all Junior Cert. I think the idea of having three separate Science subjects for the Transition Year is perfect cause I think in an awful lot of schools… Transition Year… you’ve the one Science teacher and it’s kind of a rehash of Junior Cert, you know… maybe the more interesting experiments from Junior Cert. But for me it’s great because I get me hands on students that I wouldn’t normally come across… my only agenda is to try and get as many of ‘em to, ah… come into fifth year Chemistry you know… I don’t care what way I have to do that you know.”

(Teacher 6)

Both of these teachers were very positive towards subject specialists teaching Science in the Transition Year, implying that it was a key element in the success of the their schools’ Transition Year Science programme. Teacher 4 also noted that subject specialists taught each of the sciences in the Transition Year in her school.
6.4.3 Teaching Science in the Transition Year

This section was broken down into several nodes during the analysis of the interviews. The each node was found to have various issues emerging from it. The nodes attributed to this section are: topics taught in Transition Year Science classes, teaching from the Leaving Certificate Science syllabi, teaching and learning approaches utilised in Transition Year Science classes, and rationale for teaching and learning approaches utilised in Transition Year Science classrooms.

Node: Topics taught in Transition Year Science classes

This node examined the various areas of Science that the teachers taught in their Transition Year Science classes. The teachers interviewed teach a wide variety of interesting, relevant and current topics in their Transition Year Science classes.

“Well I’ll give you an example, the Physics one an example in this one is to teach gravity and aero dynamics we do an egg drop, ammm another example in Biology we do Burger Science, well we do food tests but we use Happy Meals and we test the Happy Meal, in Chemistry we would have ammm, we make aspirin amm and we also make sparklers, Halloween sparklers so we’re working the Chemistry in a framework of fun.”

(Teacher 7)

“I do a good bit of… on DNA than as well and we do the DNA isolation which again is on the Leaving Cert course but I’m not doing it from a Leaving Cert angle. Enzymes, DNA and I also do a thing at the very start when I am working with them on, am… the brain. And I go on I do about learning styles.”

(Teacher 1)

“what we did was ammm water problems in Ireland ammm in the environmental we’ve done a year’s turning we did a video by Michael Viney, he writes for the Independent, and talked about ammm the development of 30 year of plant species and animal species we compiled questions we have worked with the green schools in compiling surveys for the work that they’ve
been doing ammm and at the minute their doing investigations on stuff like the ammm national parks, plants in Ireland, forestry’s, rivers, lakes, what the county council do all within the environmental. For Biology we usually do disease projects or something online which is something that is of interest to them in Biology it’s not necessarily from the Leaving Cert., For Chemistry it’s probably experiments and being in the lab and being used to using all the equipment because Chemistry has a lot of ammm lab procedures I suppose and for Physics we usually try to do to make it fun and to encourage them to take it up for Leaving Cert. so we’ll be focusing on that next term.”  

(Teacher 5)

This wide variety of topics taught in the Transition Year is evident through interviews with all of the Transition Year Science teachers. However, one teacher (Teacher 2) commented that they taught strictly from the Leaving Certificate Science syllabi in his school, and that the Transition Year was treated, for the most part, as a third year within the Leaving Certificate cycle. Within this year the core topics taught were the mandatory Leaving Certificate Science practical experiments.

“Well the core, the core ones are done off the syllabus to be honest with you, you know. The people that aren’t doing the lab Science they would do the core… they do another project within that. But we, we basically say we’re gonna do… a certain part of the syllabus in all three in fourth year. And ah… there is a lab science option then as part of the Transition Year. It’s separate… and that way be doing basically anything really that, that… takes the fancy of the people really like… egg drop challenges and… you know and a bit of electronics and you know stuff that you wouldn’t normally get to do in the normal… ‘twouldn’t be anything to do with the… any syllabus…”  

(Teacher 2)
While it is clear that an extensive Transition Year Science programme is present in all case study schools, many teachers mentioned that they would teach from the Leaving Certificate Science syllabi, as well as the other topics they mentioned. This is explored further in the following node.

**Node: Teaching from the Leaving Certificate Science syllabi**

Teaching from the Leaving Certificate Science syllabi is expressly forbidden in the Transition Year Guidelines (Department of Education and Science 1993). However, results in both sections 6.2 and 6.3 of this chapter have indicated that a large proportion of teachers do teach from the Leaving Certificate Science syllabi in their Transition Year Science classes. This node explores the extent to which teachers in the case study schools do this.

All teachers, other than Teacher 1 and Teacher 5, noted that they would teach from the Leaving Certificate Science syllabi in their Transition Year Science classes. The amounts that the teachers would teach varied widely.

Teacher 2 noted that he specifically taught the mandatory practical experiments, due to time constraints involved with the two year Leaving Certificate programme.

> “Specifically the practical… the, the mandatory practical’s we try and make sure they have them, some of them written up in fourth year… so that they get used to writing them up properly you know.”

(Teacher 2)

However, other issues and reasons behind this decision, such as the school management, were noted with Teacher 2. This teacher uses the Transition Year specifically as an extra year for the Leaving Certificate Science subjects, and pupils who wish to take a Science subject at Leaving Certificate choose it at the end of their Junior Certificate and take the subject from the beginning of the Transition Year, through to their Leaving Certificate.
“So they do Physics, Chemistry and Biology as...a full, they start it as a syllabus effectively. Ah... but the emphasis is slightly different... as you do project work and they really get the practical work... sorted you know... and the scientific method sorted. You wouldn’t have time to do that if you only had two year course. They’d be too busy learning stuff. But the other, the other three subjects... Physics, Chemistry and Biology would follow the, follow the syllabus exactly really... for, for the other classes.”

(Teacher 2)

Teacher 4 also taught from the Leaving Certificate Science syllabi quite deliberately.

“the first four week Chemistry module is Leaving Cert Chemistry... quite, blatantly Leaving Cert Chemistry”

(Teacher 4)

Whereas, Teacher 6 did teach from the Leaving Certificate ordinary level course, he did so in order to link it to something that might be topical at the time.

“I would teach maybe two or three... straight forward... topics from the ordinary level Leaving Cert Chemistry... course. Ah, generally in the first half of the year. I, I, I do”

(Teacher 6)

Other teachers used the year to teach some Leaving Certificate content, but in order to prepare the pupils in the skills that they would require for their Leaving Certificate.

“I’d say some content but not lots, not all like we would you know mix it up now say in the Physics now we would do a lot of say graph plotting skills, one thing like which would be like manual plots, computer plots, and just to build them up I suppose so that when they’re doing their practical’s at Leaving Cert that the options of just going on an excel package and plotting up a graph and looking at it at the end of the day and looking at you know techniques and plotting manually and comparing both and that type of thing.
So the elements of you know stuff like they’ll come across graphs in all Science areas like but there’ll be elements of it in both I suppose Leaving Cert subjects as well but you know not, not exclusively, only a small part."

(Teacher 3)

“Amm very little, no and what we do is the last few weeks of term we do an introduction to Leaving Certificate.”

(Teacher 7)

The two teachers who do not teach from the Leaving Certificate Science syllabi did note that while they do not teach explicitly from the courses they did have crossover or use experiments from the course from time to time. However this was always done in another guise.

“No, no, not at all…I would kind of steer… well I suppose it overlaps a bit because for instance I do some stuff on enzymes purely because there’s a nice little, am… experiment that I have, ah, with immobilised enzymes and we do lactase with milk and just show that there is no glucose before and there is glucose after and then we talk about a bit of lactose intolerance and all that kind of thing. Oh and another thing I started doing this year which has proved very good is the medical Physics … am the imaging”

(Teacher 1)

Amm we wouldn’t teach from the Leaving Cert. syllabus we might pick ammm experiments maybe from it because its project Science, there’s not a lot of theory in it so we wouldn’t be really teaching from it, not really, no.

(Teacher 5)
Overall, a similar proportion of teachers in the case study schools do teach from the Transition Year Science syllabi, for similar reasons to the teachers in sections 6.2 and 6.3 of the quantitative study.

Node: Teaching and learning approaches utilised in Transition Year Science classes

The function of this node was to investigate how teachers were teaching Transition Year Science, regardless of what topics they were teaching. The majority of teachers utilised a variety of teaching and learning techniques appropriate to the Transition Year.

Teachers’ tried to link the topics that they were teaching, be it from the Leaving Certificate syllabi or not, into relevant, current everyday Science.

“what I try to do is to kind of maybe link it into something that might be going on that might be topical. We’ll say... ah this year now I don’t really have a focus on it...I, I’ll explain what I did this year in a minute but... ah, last year now I did the, the fuels... ah, a little bit of organic Chemistry... and the rates of reaction and I kinda linked it into what was going on... internationally with ah... commodities markets, you know and am... biofuels and the pressure on, on kinda crops and... the soaring price of oil as it was in the summer of 2008 up to nearly $150 a barrel.”

(Teacher 6)

“I get them to do a project... using their particular learning style. So if they come out ... like there is one guy now after doing a rap for me... and it’s super... on Biology, in transition year Biology. And some of them then might do models or posters... or whatever. Rather than the usual, ah Yeah know, 5 pages of A4, cut and paste off the internet. (Laughs)... and then they present, they present them and that can actually bring about a lot of discussion. Yeah the different projects. You know a lot of; some of the stuff is stuff that they themselves would have experienced.”

(Teacher 1)
Project work and practical work was mentioned extensively by nearly all of the teachers.

“Well the Transition Year like we sort of try and promote the practical end of science I suppose more so than, well there’s a theoretical input on it as well but I mean we encourage practical’s and project work and that type of stuff you know throughout the year.”

(Teacher 3)

Despite mainly teaching from the Leaving Certificate Science syllabi in the Transition Year, Teacher 2, also mentioned the use of project work within the year.

“Now they do their own projects within core ones as well... you know.”

(Teacher 2)

Teacher 7 also commented on the practical work and the project work, but struggled to find the language to express herself in terms of the specific teaching and learning techniques used, and much of what she said was prompted by the interviewer.

“It’s all practical, all practical there is, each week you’ve 12 weeks with 12 practical’s, we have three classes each week in each module so we have one to prepare and we’ve two to do the work. It’s all active learning, ammm. Active discovery, it’s all very much....Project work group work, ammm do it yourself, go get it yourself, get the feel of the lab, find your stuff, the first few classes are, this explain where everything is kept and you try to let people get their own stuff. Yes self-directed, absolutely and to try to get them to work with teams.”

(Teacher 7)

Teacher 5 noted the specific teaching and learning methodologies that she would use when teaching Transition Year Science.
“Chemistry last year ammm we got them design a display of indicators so rather than teaching them about the indicators and the different colours they came, they were given the different indicators and they came up with a display for methyl orange, for methyl blue for phenolphthalein and for the universal indicators they had to come up with the different colours for the different pH’s something like that just to make it interesting…It would be discovery, they do investigations themselves, it would be definitely active we don’t use ammm talk and chalk or really there’s no text book as such so it has to be all of those other things we use all different types of resources, they’d be doing different types of investigations, questionnaires, it’s definitely discovery learning and active, it’s not from a book like.”

(Teacher 5)

There is a key focus on design of experiments and not using a recipe style practical activity from the text book in this schools (School 5) Transition Year Science programme..

Teacher 2, who teaches from the Leaving Certificate Science syllabi throughout his Transition Year Science classes, noted that he would focus largely on the practical side of the course in the Transition Year and that computers were used extensively.

“But like it’s all… a huge amount of computer work as well on the… a lot of the simulations of the experiments that you couldn’t do.”

(Teacher 2)

Teacher 4 did not use any particular teaching and learning methodologies specific to the Transition Year, other than more I.T. involvement and slightly more discussion in the forensics module that she taught.
“Ah… nothing that I would classify as unique to Transition Year. I’d introduce them in the same way that I might if it was a Junior Cert topic or a Leaving Cert topic. Am… with Transition Year I suppose maybe… a little bit more… I.T. involvement, Am… every double… would be practical work… and that would be the same for the Physics as well… and, and the sports science I’m sure… and, am, some singles. Am… it, when I’m teaching Leaving Cert topics in fourth year I teach it pretty much the same was as I would, a fifth or sixth year group, little bit of book work, try the experiment and write it up and all that. For the forensic science module… probably more discussion… less, more discovery on the part of the student and that kind of thing so… probably more, ah… leaving it up to the student to figure out how to do things.”

The majority of teachers interviewed use a wide variety of teaching and learning techniques in their Transition Year Science classes. Discussion is used extensively within these classes; practical work is also an important component of the Transition Year Science class, as is relating the topics to the pupils’ everyday lives. However, similar to the results presented in sections 6.2 and 6.3, the teachers in this case study rarely if ever move outside the ‘traditional’ teaching approaches in their Transition Year Science classes.

**Node: Rationale for Teaching and Learning approaches utilised in Transition Year Science classes**

Having investigated the topics and approaches teachers used to teach the various topics in their Transition Year Science classrooms it is important to explore why teachers use these approaches in the Transition Year.

Teachers 2 and 4 discussed the time constraints involved in teaching the Leaving Certificate Science syllabi and noted that teaching this topic in the Transition Year, using the approaches that he used, allowed them to cover the course in a fashion that they felt would be far more beneficial to the pupils.
“Well the time constraints number one, but also... you have more time to... teach them the proper scientific method like. Whereas in others schools they just... do that and write it up. Whereas we can actually take our time and... get them... through you know properly.”

(Teacher 2)

“Well... because... ah... it’s an advantage to those who do Leaving Cert Chemistry, it’s good to give students a taste of what Leaving Cert Chemistry is like... so they can make an informed decision on subject choices. And also because the Leaving Cert Chemistry course, if one does all of the mandatory experiments it takes a lot of time... So it enables me to finish the course... by Easter... which is very good, which the students like.”

(Teacher 4)

Another reason for taking various the approaches to teaching Transition Year Science was to keep the pupils interested.

Well it keeps them interested. It’s an interest. Without it they wouldn’t... I’d say that they were sitting there listening to us every year (Laughs) you know.

(Teacher 2)

The theme of keeping the pupils interested in the subject was a strong one among the 7 teachers interviewed. Both Teachers 3 and 5 agreed with Teacher 2 in stating that a considerable reason behind using the teaching approaches they did in Transition Year Science was to retain pupils’ interest in the subject.

“I suppose it, it retains the interest like it’s the whole variation of stimulus like you have to, you can’t take the one approach all the time there has to be some variation in the class to maintain, to retain interest.”

(Teacher 3)
Another interesting reason was given by Teacher 7, who believed that the approaches she used were important in order to develop the pupils’ maturity and sense of ownership of their subject.

“That’s what they need to work with, they need to learn to work in, first of all they need to learn their subject, they need to learn to work with other people, individually and in a group and they also need to learn their own abilities and their own limitations and they can only do that if they’re made get up and go round and do it themselves.”

(Teacher 7)

When Teacher 4’s response to how she approaches the various topics taught in the Transition Year Science classroom was probed further, and she was asked why she used these techniques she replied “Well it’s because we’re supposed to allow the student to discover the answers rather than me saying ‘this will turn blue’. (laughs)”

(Teacher 4)

Teacher 4’s phrasing is interesting, she refers to the Transition Year guidelines when she says ‘supposed to’ indicating an attempt to follow the guidelines.

### 6.4.4 Activities in Transition Year Science

This section has three associated nodes, which are: Visiting speakers, Pupil participation in science events, and School trips to Science-based Industry or related places.
Node: Visiting speakers

Many teachers noted that inviting visiting speakers would be a key focus of their Transition Year Science programme. Teacher 7 noted that they would have visiting speakers “all the time. Yeah, yeah.” (Teacher 7) Teachers’ 3, 4, and 5 also noted that visiting speakers would be a regular feature of their Transition Year Science programme. The speakers that were invited to the schools were varied, particularly depending on the locale of the school.

“Well we were going to invite you. (Laughs), ah yes we do, in fact we have a guy coming from the Physics, what’s it called ammm……….. He’s coming after Christmas. Ah Science Ireland Hands on Show at your school by Analog devices, they’re coming to us for Physics. Ammm anybody we can get! Yeah”

(Teacher 7)

“Yes, we would have a constant stream of visiting speakers here like from, you know, we’ve had engineers in recently there during engineering week, different mechanical, chemical engineers with different backgrounds, you’d have a lot of say am speakers from the point of view say of colleges round the place UCG and Sligo I.T., from different departments like…Amm big link up then with the computer department in Sligo I.T. but they come down and do, they run sorta workshops on say amm computers and applications where they’re dealing with amm the scratch program, have you heard of that one?”

(Teacher 3)

“We, we, we’ve already had two SFI speakers come to the school

(Teacher 4)
“Ammm yeah we’ had a speaker from the Ballycroy national park, we’ll probably have another speaker later on in the year to do with maybe the Chemistry or the Biology or Physics,…and we had a T.Y. show, no it wasn’t T.Y.’s sorry, it was a forensic show that was for T.Y.’s and fifth years, so they participated in that as well. So there, there’s always people, you know, if we can find someone that’s relevant to bring them in.”

(Teacher 5)

Other teachers (Teachers 1 and 2) remarked while they would consider that they have visiting speakers as part of their Transition Year Science programme, this may not be a regular feature and had a tendency to vary year on year. Teacher 1 felt that it was more difficult to get visiting speakers to come to the schools in recent years.

“Not as much as ... we used to... am. It’s just kind of like even trying to get people now is difficult. D’you know, everybody is so busy and everything but saying that I haven’t tried in the last few years...Yeah. We have. We have over the years we’ve invited a lot actually. We haven’t this year funnily enough.”

(Teacher 1)

“This year now we didn’t I must think of that next year.”

(Teacher 2)

One teacher (Teacher 6) commented that he did not invite visiting speakers ever, but also noted that someone from a chemical company would often speak to his pupils about careers in Science.
“Ah… am, no, but what, what we do have is we have a relationship with ALZA chemicals ah… and… now they would speak to them obviously about careers in science but as well as that they kind of go through this… business of CV’s and interview techniques and so on. But, ah, no… funny enough I haven’t in the past invited anybody in… am… We’ll pencil that into the future.”

(Teacher 6)

Teachers do invite visiting speakers; however, it appears that in some schools there is a slightly haphazard approach to the organisation of the Science programme in the year, with visiting speakers being invited whenever the teacher remembers to do so, rather than being an integral part of the year.

Node: Pupil participation in Science events such as SciFest or B.T. Young Scientist Exhibition

This node examines if the teachers encourage and support their pupils to participate in various Science events during their Transition Year.

Two teachers would encourage their pupils to enter and participate in events such as the B.T. Young Scientist Exhibition and SciFest.

“We do. We do SciFest, we do the Young Scientist”

(Teacher 6)

“Ah… yes. Am, we, ah, one of our Transition Year Science, we had a Transition Year student this year at the Young Scientist”

(Teacher 4)

Teacher 6 noted that, for the most part, the Transition Year pupils do not participate in these events, but mentored the younger pupils in the school, working together on projects and entries for these events.
“They are yeah, in SciFest, SciFest at the minute there, we, ah, most of our entries for SciFest would be from first year, but what we do is we assign amm the Transition Year students to mentor the group because amm I suppose they would have been through the Science Festivals when they were in first year, well the SciFest wasn’t there when they were first years but they would mentor the group, you know of the current first years, I suppose its more how to write up, what to display, you know what little things that they are doing in their investigations, that would be more their focus amm this year.”

(Teacher 3)

Other teachers would encourage their pupils to enter and participate in these events, but felt that this would vary year on year.

“Ammm not this year, last year we did, we didn’t have any good enough projects this year from them. But yeah they’re encouraged to enter and last year they got into the finals, in fact two years ago they got into the finals so yeah absolutely they would be encouraged to go for that.”

(Teacher 7)

“yeah they’re going to the BT Young Scientist in January as well, it’s another show, but if something comes up, yeah there’s no harm, we have no problem with putting it forward, we get great support… Yeah ammm they didn’t participate in the BT Young Scientist this year,”

(Teacher 5)

Teacher 5 stated that the pupils would be going to the B.T. Young Scientist during their Transition Year, but that they were not participating in the event themselves. This is in agreement with the point that this teacher feels that they get ‘great support’ in her school, even if the pupils are not participating in the event, they will still go to it.
“Yeah. Well… Yeah. We had… Young Scientist comes and goes. We had a very good run at it for a while. And then it kind of fell back a bit and now we’re trying to go forward with it again you know. It’s a very odd thing that you know.”

(Teacher 2)

Despite teaching specifically from the Leaving Certificate Science syllabi in the Transition Year, Teacher 2 mentioned that a ‘lab science’ course was originally set-up within the year to specifically promote pupils’ participation in these events.

“Technically the lab Science was originally set up… day one to… kind of encourage them to do the Young Scientist in fifth year…So that they have it done in fourth year and then… Christmas fifth year type of thing… they wouldn’t in view of their exams they could go up… but it doesn’t seem to have worked out great to be honest with you… But ah we’re hoping that we will. But we do the SciFest. We do anything like that… quizzes… anything like that that are going you know.”

(Teacher 2)

Only one teacher (Teacher 1) stated that there was no participation in events such as the B.T. Young Scientist and SciFest in her school.

Involvement, in some shape or form, is an important and encouraged experience for most Transition Year pupils in these case study schools.

Node: School trips to Science-based industry or related places

Trips to Science-based industries and other related places can be of great importance as informal education settings, opening pupils’ eyes to the wide variety of career opportunities and the relevance of Science to everyday life. This node looks at the levels of involvement in this area and the attitudes of the teachers to these trips.

The teachers were positive about school trips and would all try to take their pupils on these trips to Scientific industry and related places.

“We go out on say field trips we were up there recently at the waterworks. It would have been ammm a fantastic tour, now that the new waterworks in
Sligo is up there for the first time this year. And there would be, there would be you know down through the years, it varies like sometimes even if we’re doing a Biology we am go to the organic centre maybe in Rossinver or we go might go out to out to eagles flying conservation and animals and wild birds and stuff like that so it varies from year to year like what’s included in the programme.”

(Teacher 3)

“Am… we do trips. One trip, we, we, we will be doing next am, in a few weeks time is going to Blackrock Observatory... so we will be doing a little bit of kind of preparatory work on that then as well.” “It does… It puts us under a small but of pressure sometimes if we’ve said we’ll do this, this and this and we have to do it with each group as we rotate... I’m trying to think now in the last couple of years what we’ve done... we’ve done trips, we’ve, we’ve done, we’ve gone to the NMCI. The, the National Maritime College of Ireland... we’ve brought them to the Naval base... we’re kind of claiming all these as Science. Am… the NMCI is a fabulous trip.”

(Teacher 4)

“we had a trip to the wind farm so some of those girls would have gone down to Belmullet wind farm in Belmullet, it’s down there”

(Teacher 5)

“Well, in, in the past I have taken them to ah... we have taken them down to Merck Sharpe and Dohme and I’ve taken them on a few occasions into UL as well am... and that’d be it.”

(Teacher 6)

As the above statements illustrate, the Transition Year Science teachers do attempt to provide a wide variety of school trips, viewing these events as wonderful opportunities for informal learning. However two teachers (Teachers 1 and 7) expressed negative experiences when planning and organising school trips.
“Am…like… we went to the zoo, we went to the… the, am… the national stud. They went, now I didn’t go when they went to… the ‘Bodies’ exhibition. No they didn’t go to the ‘Bodies’ exhibition… that actually wasn’t allowed.”

(Teacher 1)

Constraints with boards of management regarding the content of the school trip had curtailed certain trips in the past for Teacher 1. She expressed doubt as to the availability of opportunities for these types of trips, particularly in the current economic climate. There were also issues with the time requirements involved to organise these trips.

“Am… again those kind of things aren’t as… available. And an awful lot of it then, as well, is just… school life is so busy and trying to organise something… like even going to the zoo last year I, like, it was mad, trying to organise who was to go and then getting… you know was it better to get a bus, was it better to go on the train, you know, by the time you’re finished doing everything like you’d be”

(Teacher 1)

Teacher 7 also expressed feelings about the difficulty of organising trips to Science events or industry in the current economic climate.
“particularly when we want to bring the kids on trips, we want to bring them to things. So, instead of, for insistence, the L.I.T. show, I went, because we couldn’t afford to bring the whole school. We couldn’t afford to bring all our kids, ah it was just too expensive….Absolutely, absolutely! It’s affecting the quality of the teaching in the school, when it’s affecting our ability to bring the kids outside the school. And maybe to introduce them to a wider world, and we would love to bring them to sewage treatment plants, we’d love to bring them to you know anywhere, but we just have to be, we’re only allowed so many trips a week and it’s, you know, it has to be negotiated with the Headmaster.”

(Teacher 7)

Teacher 7 strongly believed that the lack of trips to Science-based industry and related places affected the pupils’ experiences of Science in the Transition Year.

The teachers were innovative in their linkages with industry and with the organisation of events within the school.

“we do ah... we run a primary school Science quiz here as well just to generate interest in the primary schools. I get the fourth years to host that on the night. We only ran it there a couple of weeks ago in fact. ‘Tis sponsored by Alza chemicals. The prize fund is over a hundred and… is over one thousand five hundred euros you know… between trophies and cash. We’ve thirty seven tables from seventeen different primary schools...And fourth years host it. We, we present the questions using PowerPoint in big, big study halls is a great medium for a Science quiz.”

(Teacher 6)
“ammm we have a local; I think it’s run by the county council where they have to design...maybe an airplane out of paper, or toilet roll holders, something like that you know, ammm they did that last year, they didn’t do it this year, but what they’re doing this year is ammm a debating they’re part of the REMEDI from NUI Galway and they’re taking part in the Science debating so there’s a good crowd of them are involved in that, there’s also an essay competition, I don’t know yet how many of them taking that, there’s also a rap competition there’s always something, you know the Universities are running stuff and yeah they involve themselves in that.”

(Teacher 5)

There is a clear mixture of events and activities, both internal and external within the schools, despite budget constraints in this area. The teachers believe that the variety of activities and trips are a positive experience for the pupils, and can promote linkages between real world science and traditional school science.

6.4.5 Obstacles to teaching Science in the Transition Year

The course of the interview led to a discussion of possible limitations to teaching Transition Year Science. When analysed two nodes were visible to the author; school-based limitations and budget.

**Node: School-based limitations**

The teachers were asked about the limitations the felt they experienced when teaching Transition Year Science. Nearly all the teachers (6 out of the 7) were very positive, noting that they experienced little to no limitations.

“No, time in the lab is allocated ammm when the timetables are being done so it’s taken kinda seriously that they get into the lab the same as the rest of the classes there’s no problems getting into the labs.”

(Teacher 5)
“It’s all ready, I mean because there is a lab technician it’s there. Everything’s ready!”

(Teacher 7)

Interestingly the only teacher to note that there were occasional issues was teaching in a vocational school, with a poorer socio-economic status compared to the other schools in the sample.

“But, am… ya there’d be constraints and you can see the room here isn’t par… it’s not entirely suited but I don’t want to give it up either… you know, cause it’s a third, ah… Science lab really you know.”

(Teacher 6)

The room that the teacher was speaking about was a classroom, with some Science apparatus around it that would allow pupils to do simple experiments in a non-laboratory setting. No issues or constraints to teaching Transition Year Science were mentioned by any other teachers, other than teacher 6.

**Node: Budget**

When teachers were asked if they experienced any constraints in teaching Science in the Transition Year due to budgeting issues the responses were mixed. One teacher noted that it was not an issue and that her school did have a specific budget for Transition Year.

“And am... kind of there is a little budget for, specifically for Science within the Transition Year. Am... generally Transition Year are hit by budget constraints but I think we just needed... so little extra anyway, you know because like you’d have most of the stuff.”

(Teacher 1)

Teacher 5 also noted that this was not an issue in her school, but that she could not be certain, as she was not involved in this area.
“Ammm not that I know of, but maybe the next time I go to ask for something I’ll find out that there is. Ammm I don’t do the budgets there’s, there’s one teacher that would you know do the budgets, I don’t remember anything ever being asked for that we couldn’t afford d’y know anything we need I don’t know.”

(Teacher 5)

Other teachers felt that overall, they were not hit by budget constraints in a serious way, but that they did feel the effect of them. This was particularly true in terms of school trips.

“I’d say, ah… not in terms of… ah chemicals and glassware but in terms of perhaps am, trips… definitely yes…We didn’t do Science week did we? (laughs) Not much… but we are up to the observatory I have already said that.”

(Teacher 4)

“Yes, particularly when we want to ring the kids on trips, we want to bring them to things. So, instead of, for insistence, the L.I.T. show, I went, because we couldn’t afford to bring the whole school. We couldn’t afford to bring all our kids,…ah it was just too expensive.”

(Teacher 7)

Teacher 6 recognised that there were certain constraints, but that this is typical and that he got around this by being resourceful and going to local industry for help if necessary and the constraints that are in place have not trickled through to affect his teaching in the Transition Year.
“Well there will always be constraints on resources and, and funding... finances you know... am... maybe replenishing chemicals and equipment. In the past what we’ve done here is we, we’ve gone to local industries... and we’ve gotten glassware, lab coats... There is money out there externally you know or at least there was up until the last couple of years you know... a lot of that dried up as well I suppose. If they have...I’m not aware of it. D’you know it hasn’t kind of funnelled through here anyway.”

(Teacher 6)

Teacher 3 remarked that while there were definite constraints regarding money in the school, it had effected all departments evenly, and that the Science department was not hit more severely than others in the school.

“I’d have to say yes, I’d say in general the whole school has been hit, so I mean everyone is asked to tighten their belts a little piece so I mean it would be no different in Science than in any other department really.”

(Teacher 3)

Overall, budget constraints were not considered, by the teachers, to be a barrier to the teaching of Transition Year Science in these teachers’ schools, but it did affect the overall pupil experience of Science in the Transition Year.

**Node: Pupil absenteeism**

Student absenteeism was an issue for all teachers interviewed, however the teachers’ attitudes towards it were not as negative as one might expect. The majority of the teachers recognised that pupil absenteeism was nearly always due to other school activities and that this is an integral part of the Transition Year.
“Yeah definitely, there’s always something else on. Ammm the girls just kinda they might be there for one week of the Science, the next week they might have missed because they’re gone. There’s a load of competitions, there’s a lot of, you know art or music or drama, anything there’s lots of stuff going on. But ammm I think that that’s the nature of T.Y. and I think it’s good for them to get into the things that they like so.”

(Teacher 5)

However, pupil absenteeism is an issue when it is not timetabled well and it affects one group all of the time. Teacher 1 remarked that:

“I had four groups this year, and there’s one group and I hardly saw them at all. Literally, now I mean literally, hardly saw them at all. And that was because it just, there just happened to be a lot of … there was, they put on a musical every second year so the musical was on this year… so that crowd and… I happened to hit with this crowd when they were doing social placement. Now that didn’t happen with any other group. So, you know you get more in with certain groups and less in… so that again is the nature of it.”

(Teacher 1)

“Well, what really happens in the second half… unfortunately is they’re involved in so many different things, ah… it can be… you could go for weeks without seeing them… But again that can be difficult as well because… there’s, they’re involved in so much stuff that time of the year that, ah… you can… you know you can run into difficulties in terms of time you know.”

(Teacher 6)

This type of consistent absenteeism of one group raises the issue of equality, in that the various groups experiencing Science in the Transition Year may have vastly different experiences due to the unevenness of timetabling of school activities in the year.
Teacher 4 was very positive about pupil absenteeism, viewing it as an opportunity to do something new or innovative that traditionally may not be possible due to the large class size.

“It happens but, in a way it’s, it’s an opportunity as well, so suddenly if I have a class half the size, we, we, maybe I’ll do something completely different that the people I have will thoroughly enjoy, so…”

(Teacher 4)

In general there is pupil absenteeism in Transition Year Science, however, it is not confined to Science and teachers believe it is something that all Transition Year teachers experience. The teachers believe that the wide variety of activities experienced by pupils in the Transition Year, which are the primary cause of pupils’ absenteeism, are an essential part of the Transition Year programme.

6.4.6 Preparedness to teach Science in the Transition Year

The theme of teacher preparedness to teach Transition Year Science was broken-down into two nodes: pre-service teacher training, and in-service teacher training. The levels of each were examined, as were the teachers’ attitudes towards this.

Node: Pre-service teacher training

The node ‘pre-service teacher training’ explored the training that teachers received in their teacher training courses (either in their concurrent teacher education degree or their Higher Diploma in education). Pre-service training for teachers in the area of Transition Year Science, was, not experienced to any great extent for this group. As three of the teachers had been teaching for over twenty five years, it was noted that the Transition Year was not in existence when they were pre-service teachers. Teacher 1 notes that this is true of the time that she did her Higher Diploma in Education.
“Absolutely not. TY wasn’t even invented…”

(Teacher 1)

As does Teacher 3 “Well, when I did my H.Dip. there was no such thing as the Transition Year” (Teacher 3).

Teachers who have completed their teacher training since the inception of the Transition Year also noted that they received little pre-service training.

“Ammm I think probably that I got it more from the experience of teaching as opposed to the H. Dip, I don’t remember, maybe we did design a TY curriculum, I don’t know, I don’t remember, it would really be from teaching it and getting experience of what they need to do, yeah.”

(Teacher 5)

Teacher 6 echoed the experience of Teacher 5 somewhat, as he noted that most of his experience would have come from the teaching of the year.

“I woulda said ‘twas adequate. I, I woulda said ‘twas adequate but I’d be coming at it from a different angle in that I would’ve had a lot of years of experience before doing the HDip.”

(Teacher 6)

Training teachers to design and teach their own Transition Year Science curriculum does not appear to form any part of pre-service teacher training.

**Node: In-service teacher training**

The node ‘in-service teacher training’ examined the level and type of training related to Transition Year Science, if any, that teachers received once they were qualified to teach or teaching Transition Year Science. The teachers did not feel that they had received in-service training to teach Transition Year Science, or whether this type of training was even available. Teachers 1 and 2 both agreed that there has been no formal in-service training in the area of Transition Year Science, but they believed
that there was material available, and there were some in-service courses, if teachers were willing to attend voluntarily.

“Am … well in-service as formal in-service … no… Am, but then again I had been out of teaching … so I know that there was some in-service given already, alright, at the time … but, am, saying that, I … there would have been a lot of in-service available kind of after school… on a voluntary basis really… A good lot… And I would have attended a good lot”

(Teacher 1)

“No. But there’s plenty… there is plenty of stuff there. The SLSS stuff are very good. Again, it does… there’s a lot of resources there… and you could voluntarily go I suppose… if you know what I mean. But, am… I didn’t think there was any real need really you know.”

(Teacher 2)

Teacher three was in agreement with both teacher one and teacher two on the lack of in-service training, but did not believe that there was any type of training available, voluntary or otherwise.

“In-service, no there’s been little to no in-service on any of the new stuff. There’s certainly new modules that come out in Science, but there’s never been an in-service programme on them as such like not that we’ve participated in. Like we might see the modules that are there and pull bits and pieces from various ones. Like we don’t present any one particular one… No, nothing at all, nothing at all.”

(Teacher 3)

Teachers expressed some mixed views on the provision and availability of in-service training for Transition Year Science. While they were in agreement that there was little to no formal provision of Transition Year Science in-service courses they did feel that some ‘voluntary’ courses would have been available if teachers wished to attend. This links to the idea of teacher motivation. One has to assume that if in-
service training is offered to Transition Year Science teachers on a voluntary basis; it may be the more motivated teachers, or those who feel that they are in great need of the help who attend.

6.4.7 Transition Year Science resources

The theme of Transition Year Science resources encompasses three nodes. The first node examines the resources that Transition Year Science teachers are using in their classrooms. The second node looks at where the teachers source these resources that were used when teaching Transition Year Science. The third and final node, explores the teacher’s beliefs and ideas regarding the availability of these resources.

Node: Resources utilised by teachers in Transition Year Science classes

There is a wide variety of resources from which Transition Year Science teachers can choose when teaching their Transition Year Science classes. The teachers mentioned a considerable list of resources used in their Transition Year Science classes, many developed by the teachers themselves.

Five of the seven teachers were using the ‘TY Science’ modules from the University of Limerick.

“We’d use, we’d use a computer labs like you know we’d always request that no one, that when Science is timetables in TY that at least one of those classes is in an available computer room, so we would have access to computers, the internet, amm that type of thing. We have a library up there with a Science section as well so they can use that...Oh there’s resources and there’s modules developed in it like could be on energy, it could be forensic Science it could be whatever.”

(Teacher 3)

“And uses the, am... the UL...(UL ‘ TY Science module’) And in the Chemistry, we use for... one of four weeks we use the forensic Science module...Am (laughs)... ah... lab equipment, ah... my laptop... I, ah projectors”
Teachers were also using their own collection of resources that they had developed for their Transition Year Science classes throughout their years of teaching. Other resources mentioned by the teachers were computer laboratories, the internet, videos, and DVDs. Teacher 1 was using a Medical Physics resource, as well as the interactive whiteboard and Power Points, while teacher 2 was teaching from the Leaving Certificate Science syllabi, and not incorporating other resources into the Transition Year Science classes.

**Node: Sources of Transition Year Science resources**

The Transition Year Science teachers had many sources for the various resources that they were using. Teacher 1 believed that there are many available Transition Year Science resources on the market, particularly from laboratory suppliers.
However, she also noted that these resources did cost money, and were only available if teachers had the money to buy them.

“I have found… a good lot of stuff. The… the, am… the companies like Lennox, Shaws, these… they, of course, like I mean they’re delighted to find a niche, but, am… they as well provide stuff. There is a good lot of stuff there obviously if you have the money to buy it, and you can get a good lot of stuff reasonable enough.”

(Teacher 1)

Other resources were passed on from contacts in other schools.

“We got the forensics one ammm, from Taylor’s Hill in Galway, from a teacher there and the environmental we’ve kind of just built up ourselves yeah. The forensic module, the environmental module that we come up with ourselves,…ammm what other resources, we have a box made up for T.Y. Science for the forensics and for the Physics.”

(Teacher 5)

“Am I make up, the lab technician makes up the modules, makes up the Physics Chemistry and Biology handout and then we kinda have a meeting and we go through what we want to do each year and then we have a handout that we give the kids each year. And equipment we just you know, most of the stuff is Poundshopped, its Poundshop, its Lidl, its Craft Suppliers.”

(Teacher 7)

Teacher 7 would make up her own resources, she notes that the schools laboratory technician would make up these resources, however, she is the laboratory technician, but is also teaching Transition Year Science. Most of the teachers interviewed would have made up a wide variety of their Transition Year Science resources themselves.
Node: Availability of Transition Year Science resources
The teachers did believe that Transition Year Science resources were readily available and accessible.

“No, Easy, easy, yeah.”
(Teacher 5)

“Do I feel they’re available?...Yes”
(Teacher 4)

No teacher mentioned that they had difficulty in finding or accessing Transition Year Science resources. This leads to the question: Do teachers teach from the Leaving Certificate Science syllabi in the Transition Year due to a lack of alternative resources? This will be discussed further in Chapter 8.

6.4.8 The effect of the Transition Year on Leaving Certificate Science
This theme investigates teachers’ opinions on whether taking Science Transition Year has any effect on Leaving Certificate Science. The analysis of this theme required it to be broken down into three different nodes. The initial node examines the impact of the year on the uptake of Leaving Certificate Science subjects, and the second node investigates the teachers’ beliefs and opinions on the effect of Transition Year Science on pupils’ subsequent performance in Leaving Certificate Science. The final node arose due to the number of teacher comments that arose during the course of the interviews on what factors are involved for pupils to take Science at Leaving Certificate level.

Node: Impact of Science in the Transition Year on the uptake of Leaving Certificate Science
This node explores all aspects (positive, negative and unsure) of the teachers’ beliefs on the effect of Transition Year Science on pupils’ uptake of Science at Leaving Certificate.
The majority of teachers interviewed were very positive about the effect of Science in the Transition Year on the pupils regarding their uptake of Science subjects at Leaving Certificate.

“Yes. Yes and I can only speak for myself... Yeah know for my own subject, that definitely the guys in fifth year, that have come through transition year... they are more adept you know there’s a lot of mandatory practicals obviously now in all Science subjects and even them being acquainted with the lab and acquainted with, d’you know, getting the stuff or where the stuff is. They are much, much better equipped than the guys that come straight out of third year. Saying that, most of our fifths years... and I’m just thinking most of our fifth years doing Biology... would have been the transition year crowd... cause like my fifth, my fifth year group now this year. We would have had two classes this year, Diane has the other class.”

(Teacher 1)

“I, I’d say yes. I mean still like we’d say our uptake, say for the physical Sciences – the Physics and Chemistry is quite small and traditionally in a girls school you’re going to have high numbers doing the Biology and small numbers doing the Physics and Chemistry. Certainly, you know over the years from following those Science modules, you’ll always get a couple of students who come into your Physics or your Chemistry and say look because I experienced this in Transition Year and I didn’t think it would be this, Physics would be like this for Leaving Cert, or Chemistry would be like this for Leaving Cert. It would have an impact, but like everything else not on a scale like, the numbers wouldn’t be huge in Physics and Chemistry there, you’d have a couple coming in...No, I’d say, I’d have to say the normal situation is that because we have such a high participation rate at a high, such a high participation rate at TY, about 90%, that the vast majority that go into do either Physics or Chemistry come from the Transition Year.”

(Teacher 3)

“it gives me the opportunity then I suppose in the last couple of months of, of the Transition Year to… to really... go on a charm offensive really, you know
just to get as many of them in as possible you know... and it has worked you know, but without it... I wouldn’t envisage too many people would’ve taken up Chemistry in the last few years.”

(Teacher 6)

However, Teacher 6 qualified his positive reaction to the impact to the year on the uptake of Science subjects at Leaving Certificate with the statement that “as long as it was taught by the relevant specialist, you know.”

(Teacher 6)

“Ammm Ok, we have 23 in Physics, in Leaving Certificate Physics right now, there are two Biology classes and we have one Physics class and it’s normally full (24) and then in 5th year Physics we would have maybe 19/20 and we think that that is a direct result of the Transition Year modules.”

(Teacher 7)

Teacher 1 was so positive about the impact of the year that she credited it with the revival of Applied Mathematics at Leaving Certificate in her school.
“Now our… our applied maths had fallen away, but its back on this year as a result of applied maths in…Transition Year… definitely Yeah…They even go to the snooker hall at some stage you know. Quite what I’m not too sure, but I’m sure it has something to do with applied maths, trajectories and all that sort of thing… Am, Chemistry and Physics aren’t doing great in fifth year. Like there’s one class of Physics, one class of Chemistry, which again in a boy’s school… you’d think that there would be more…Ah, there’s about eighteen in each of them.”

(Teacher 1)

Only one teacher (Teacher 5) was unsure about the impact of the year, because she had never known the school not to have a high uptake of the science subjects, particularly Biology. This gives an interesting insight into the ethos of the school, and the regard with which the Science subjects are held.

“I don’t really know about here because it’s always been so high, the Biology has huge uptake, there are a lot of girls, the vast majority of them are doing Biology, there’s only really a few of them who aren’t doing that and there’s very few who’re doing Chemistry that aren’t doing Biology so most people are doing Biology and if they’re doing Chemistry they’re doing it as well…It probably does encourage it, yeah I’d imagine it does because they have Science”.

(Teacher 5)

Teachers are overwhelmingly positive about the effect of the year on pupils’ uptake of Science subjects at Leaving Certificate. They believe that the year has a strong impact for a variety of reasons such as the opportunity to become comfortable and familiar with the laboratory and associated apparatus, the subject teacher and the variety of interesting and relevant activities carried out in Transition Year Science classes.
Node: Effect of Transition Year Science on pupil performance in Science at Leaving Certificate

This node elicited mixed reactions from the teachers interviewed, while they did believe that Transition Year Science was influential in promoting the uptake of Science at Leaving Certificate, with some teachers unsure about the effect of Science in the year on pupils’ performance.

Three teachers were positive about the effect of Science in the Transition Year. However, one of these teachers was Teacher 2, who previously stated that used the Transition Year as an extra year to teach the Leaving Certificate Science course.

But I think what’s happening is that... the take up is bigger in fourth year because... the results are very good in sixth year...So that kind of feeds into itself. It’s like a loop, you know...And the next fourth year boys going in and they’re seeing... you know they’d three years to do the course effectively so...

(Teacher 2)

“I’d have to say that it would impact and you’d definitely notice the difference in the Transition Year students sitting in front of you and the student coming in for the first time round and there’s a maturity and stuff like that and I think that, you know, it would have a positive impact on their, their achievement at the Leaving Certificate level.”

(Teacher 3)

Ah I’d have to get someone to check, but our results are good, we’re getting A1’s, we’re getting A1’s and we get very few failures in Science.

(Teacher 7)

Both Teacher 3 and Teacher 7 did believe that Transition Year Science had a positive impact on pupils’ performance in Science at Leaving Certificate.

The remaining teachers were unsure about the effect of taking Science in the Transition Year on pupils’ performance in the Leaving Certificate Science subjects.
“I have no idea. I’m sorry”

(Teacher 5)

“Well I don’t... I don’t actually have experience of this school without Transition Year.”

(Teacher 4)

“They would probably have a little edge...But again you’d have to qualify it by saying... that a lot of students that might skip the Transition Year... am... and go straight into, we’ll say, fifth year Chemistry... some of them, well some of those students would actually be very capable. They’re just very focused individuals. They just wanna get in and get out. But I, I would say, on balance... doing Transition Year certainly gives them that little bit of a maturity or an edge or something... you know in terms of Chemistry I mean.”

(Teacher 6)

Overall teachers are positive about the effect of Science in the Transition Year on pupils’ performance in Leaving Certificate Science. Their reasons for this are, in the main, due to the maturity of the pupils that develops during the course of the Transition Year.

*Node: Factors involved in uptake of Leaving Certificate Science*

Analysis of the teachers interviews under the theme of the effect of Transition Year Science on Leaving Certificate Science led to the creation of a third node to explore the factors that teachers led aided or inhibited the uptake of Leaving Certificate Science.

Some teachers believed that the relevance and enjoyment of subject is very much a factor for pupils when they are deciding what subject to take at Leaving Certificate, as well as knowledge of what the subject will be like. Teachers believed that the Transition Year offered an opportunity to showcase these aspects of Science to the pupils.
“Because it’s explained to them what’s necessary and also… There’s two reasons, one is they see a future in Science to get a job out of it, and the secondly they know that it is a hard subject, but they know that it’s going to be fun. They enjoy it and it’s interesting, they won’t be bored. They’re definitely not going to be bored at it.”

(Teacher 7)

“It’s a definite you know class where they know what they’re going to be doing, they’re not going in, and I don’t mean that the other classes aren’t definite, but we would have a programme that we would follow through with, they would all have had their Science. Maybe it does encourage them to do it at Leaving Certificate I’d imagine it does but I don’t know the statistics or anything.”

(Teacher 5)

Teacher 4 also echoed these sentiments, noting that the Transition Year Science class offered an opportunity to give the pupils a real impression of the Leaving Certificate Physics and Chemistry courses and their relevance.

One teacher felt that many pupils have a lasting impression of what Science is like from their Junior Certificate and enter the Transition Year with their minds already made up regarding their future subject choices.
“in Junior Cert. and in T.Y. ammm some of them have definitely made up their mind, or seem to have made up their mind by the time they come into the T.Y. about what Science subjects they’re going to be doing or at least what they’re NOT going to be doing for the Leaving Cert. Ammm we’ve started that subject taster I was telling you about ammm we hope that that will encourage the subjects that have kind of haven’t been taken up for the last year or two for example Physics has very low uptake ammm we’re hoping that that will encourage that.”

(Teacher 5)

Teacher 5 put emphasis on the pupils having made up their mind as to what Science subjects they will not be taking for their Leaving Certificate before they enter Transition Year. This type of statement indicates that Teacher 5 believes that some pupils have developed a dislike of Science from their experiences of the subject at the Junior Certificate. This deep-rooted attitude or perception may be quite difficult to change.

Only one teacher noted that timetabling constraints could affect the subjects that pupils choose for their Leaving Certificate. This is quite an interesting point, and can reflect the emphasis that the school puts on the science subjects.

“Yeah… ah that’s a very hard question you know a lot of it comes down to subject choice, you know the choices that are available in the schools I think you know. Am… well I know like in, in terms of Chemistry… very often Chemistry would be up against something like construction studies. So over the years I have found that… as they say all the oestrogen comes in here and the testosterone goes the other way you know. So that has certainly worked in my favour as well in that it’s a limited choice but… a lot of, it, it, it’s not… too constraining in that, that particular choice might be for most people… their ‘A’ subjects, so ‘tis their extra subject if you know what I’m saying. Ah, so… it isn’t like as if they’re being press ganged into doing one or the other. A lot of them will come in, and I will lose a lot of them as well. In the past I’ve lost a lot of them in fifth year… ah, for the simple reason that, that they never really wanted to do Chemistry it’s just that they really didn’t want to do construction studies d’you know.”
Other teachers believed that there is a perception that the Science subjects are difficult; however these teachers appeared to believe this themselves, as illustrated in their comments below.

“but you also have the guys that are going to run a mile from it because they are hearing that it is difficult to get the points… in the Science subjects. You know like compared to, we’ll say geography, business studies are perceived… so they’re; they are inclined to go that way.”

(Teacher 1)

When Teacher 1 was asked if she believed that it was more difficult to achieve high points in Leaving Certificate Science she replied: “I think it is.”

This response links to the findings of the Drumcondra report (Kellaghan and Millar 2003) which also indicated that this is not merely a perception of teachers and pupils, but Science subjects are in fact more difficult to achieve high grades in when compared with other subjects.

“it also gets rid of the people who don’t think they can do it. We don’t have people coming along to do it thinking it’s going to be easy, they know exactly what’s involved”

(Teacher 7)

There are many varied reasons effecting pupils’ uptake of Science subjects at the Leaving Certificate, ranging from school based issues to deep-rooted attitudes and perceptions towards the Science subjects.

6.4.9 Summary of Qualitative Study

The findings of the Transition Year Science teacher interviews conducted in Phase 3 are summarised in this section. As found in the other phases, the Transition Year Science teachers are all well qualified and experienced. Interestingly, Science teaching was the career path of choice for only two of the teachers interviewed. All
of the teachers interviewed viewed the role of Science in the Transition Year as ‘essential’ and ‘important’, particularly in order to capture pupils for senior cycle, and to teach them about current, topical, relevant Science. Science in the year was also viewed as an important opportunity, by some, to cover some of the Leaving Certificate Science syllabi. The Transition Year Science teachers believed that it was important that the Science subjects being taught be taught by subject specialists. A wide variety of topics were taught in all schools, utilising various teaching and learning methodologies, but 5 out of the 7 teachers interviewed did teach from the Leaving Certificate Science syllabi. As mentioned the teachers encompassed a wide variety of approaches in their teaching and learning methodologies, however, there is still a tendency for some to remain within the realm of traditional practices. Other teachers were better illustrating clear examples of IBL, active learning, CBL, and PBL. The teachers teach with these approaches in order to capture the pupils’ interest, and to develop their maturity and thinking skills in order to allow them to take ownership of the subject and become self-directed learners. The teacher interviewed in the Case Study schools placed an emphasis on learning outside of the classroom, and had a good emphasis on visiting speakers, school trips and Science events. There were barriers to the experiences, these were financial, and pupil absenteeism. Teachers noted that they had little to no pre- or in-service training in order to prepare them to teach Science in the Transition Year. They believe that the Transition Year Science classes have a positive effect on the pupils uptake of Science subjects at senior cycle, but that pupils will only take Science subjects if they are relevant and they enjoy it, as many have already made up their mind prior to the Transition Year.

6.5 Conclusions
This chapter has presented the key findings from teachers examined in all three phases of this study. The implications of these findings will be discussed more fully in Chapter 8.
CHAPTER 7: PUPIL RESULTS
7.1 Introduction

This is the final results chapter and the aim of this chapter is to examine the pupils’ experience of Transition Year Science. The results of the second level pupil and third level student surveys are presented in this chapter, in both graphical and tabular format, and are discussed. This is the first study of its kind in Ireland, there have been many studies examining various interventions in the Transition Year, but none chronicling the pupils’ experience of Science in the year. Results from the Transition Year pupil questionnaires and from the third level student questionnaire will be outlined and comparisons drawn between the responses of the Transition Year pupil cohort and the Junior Certificate control group. Each area reported in this chapter will be linked with the results from the two preceding results chapters, and discussed within the context of the whole project in chapter 8.

7.2 Results of Transition Year Pupil questionnaire

Two groups of pupils (N = 319) were surveyed using two different instruments in 2009. In the first group, the pupils surveyed (N = 277) were administered a questionnaire at the end of their Transition Year, and are attending a school which offers the Transition Year programme. The questionnaire was designed to explore the pupils’ attitudes and feelings towards Science. It also sought to identify how the Science in the Transition Year was being utilised in the schools that offer the programme. The second group of pupils (N = 42) were at the end of their Junior Certificate programme. This second group was the control group and was used for comparison against the Transition Year group. The instrument utilised with this second group was a questionnaire, both the questionnaires can be viewed in Appendix C.

The questionnaires employed to survey both groups of pupils were essentially the same instrument, but for a few minor differences, relating to questions investigating the pupils’ feelings and experiences of their Transition Year, which were not asked of the second Junior Certificate group. Results from the Transition Year group will be reported comprehensively in this chapter, and where the author deems necessary comparisons will be drawn with the group of Junior Certificate pupils.
7.3 Pupil profile and demographics

The pupils surveyed (N = 277) were administered the questionnaire at the end of their Transition Year, and are attending a school which offers the Transition Year programme. The questionnaire was designed to explore pupils’ attitudes and feelings towards Science. It also sought to identify how Science in the Transition Year was being made available, and taught to pupils in the schools that offer the programme.

Of the 277 pupils surveyed 121 (43.7%) were male and 156 (56.3%) were female. Pupils’ median age was 16 (n = 218, 78.7%), though a small percentage of the cohort were 15 (n = 36, 13.0%), and 17 (n = 22, 7.9%) years of age, with one pupil aged 19 (0.4%). Table 7.1, indicates the number of pupils in each type of school. It is obvious from this sample that the only schools that had a single sex gender intake were secondary schools.

Table 7.1: Breakdown of cohort by school type and school gender.

<table>
<thead>
<tr>
<th>School Gender</th>
<th>Secondary School No. of pupils (%)</th>
<th>Vocational School No. of pupils (%)</th>
<th>Community and Comprehensive School No. of pupils (%)</th>
<th>Total No. of pupils (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>33 (11.9%)</td>
<td>0 (0%)</td>
<td>0 (0%)</td>
<td>33 (11.9%)</td>
</tr>
<tr>
<td>Female</td>
<td>74 (26.7%)</td>
<td>0 (0%)</td>
<td>0 (0%)</td>
<td>74 (26.7%)</td>
</tr>
<tr>
<td>Co-educational</td>
<td>61 (22.0%)</td>
<td>60 (21.7%)</td>
<td>49 (17.7%)</td>
<td>170 (61.4%)</td>
</tr>
<tr>
<td>Total</td>
<td>168 (60.6%)</td>
<td>60 (21.7%)</td>
<td>49 (17.7%)</td>
<td>277 (100%)</td>
</tr>
</tbody>
</table>

7.4 General information about the school and school Science

This section of the chapter is designed to give an overview of the pupils’ attitudes and provide background with regards to their experiences of school and school Science. Pupils were asked to name their favourite and least favourite school subjects. Tables 7.2 and 7.3 below indicate the pupils’ favourite school subject;
Science did not feature in the top five favourite subjects. Chi-square tests were conducted and significant differences (p<0.05) were observed between the genders. Female pupils’ (n = 155) favourite subject was, on average, Art (17.4%), and their least favourite school subject (n = 150) was Mathematics (25.3%). Mathematics was both favourite (16.4%) and least favourite (25.0%) school subject for male pupils (n = 116). Science was male pupils’ fifth least favourite subject overall, it did not appear in female pupils’ top five least favourite subjects.

<table>
<thead>
<tr>
<th>Ranking</th>
<th>Favourite School Subject</th>
<th>No. of pupils (%) (n = 271)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1&lt;sup&gt;st&lt;/sup&gt;</td>
<td>Mathematics</td>
<td>36 (13.3%)</td>
</tr>
<tr>
<td>2&lt;sup&gt;nd&lt;/sup&gt;</td>
<td>Art</td>
<td>31 (11.4%)</td>
</tr>
<tr>
<td>3&lt;sup&gt;rd&lt;/sup&gt;</td>
<td>English</td>
<td>29 (10.7%)</td>
</tr>
<tr>
<td>4&lt;sup&gt;th&lt;/sup&gt;</td>
<td>Music</td>
<td>24 (8.9%)</td>
</tr>
<tr>
<td>5&lt;sup&gt;th&lt;/sup&gt;</td>
<td>Home economics</td>
<td>23 (8.5%)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Ranking</th>
<th>Least Favourite School Subject</th>
<th>No. of pupils (%) (n = 266)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1&lt;sup&gt;st&lt;/sup&gt;</td>
<td>Mathematics</td>
<td>67 (25.2%)</td>
</tr>
<tr>
<td>2&lt;sup&gt;nd&lt;/sup&gt;</td>
<td>Irish</td>
<td>43 (16.2%)</td>
</tr>
<tr>
<td>3&lt;sup&gt;rd&lt;/sup&gt;</td>
<td>French</td>
<td>37 (13.9%)</td>
</tr>
<tr>
<td>4&lt;sup&gt;th&lt;/sup&gt;</td>
<td>English</td>
<td>31 (11.7%)</td>
</tr>
<tr>
<td>5&lt;sup&gt;th&lt;/sup&gt;</td>
<td>Science</td>
<td>14 (5.3%)</td>
</tr>
</tbody>
</table>

When subject rankings were compared, using Mann Whitney tests, between the Transition Year pupils (group 1) and the Junior Certificate pupils (group 2) no significant differences were found. However, there were some differences. Transition Year pupils’ favourite subject (n = 271) was Mathematics (13.3%), this was also their least favourite (n = 269) school subject (24.9%). Junior Certificate pupils (n = 41) also ranked Mathematics as their favourite subject (19.5%). Geography (21.9%) was Junior Certificate pupils top ranking least favourite subject. Science was the fifth
favourite subject for Junior Certificate pupils (7.32%), but it was also the fifth least favourite subject for both the Transition Year pupils (5.20%) and the Junior Certificate pupils (9.76%).

Interestingly, when pupils were asked in a separate question to rank Science among their top four (in terms of achievement) Junior Certificate subjects, the subject fared better. Pupils ranked Science relatively highly, with over half (57.9%) ranking the subject in their top four school subjects, as indicated in Table 7.4. However this question may have been ambiguous and pupils could have been ranking the subject in terms of how they achieved in it.

Table 7.4: Pupils’ ranking of Science among school subjects

<table>
<thead>
<tr>
<th>Science Ranking among top school subjects (n = 275)</th>
<th>No. of pupils (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1&lt;sup&gt;st&lt;/sup&gt;</td>
<td>17 (6.2%)</td>
</tr>
<tr>
<td>2&lt;sup&gt;nd&lt;/sup&gt;</td>
<td>34 (12.4%)</td>
</tr>
<tr>
<td>3&lt;sup&gt;rd&lt;/sup&gt;</td>
<td>72 (26.2%)</td>
</tr>
<tr>
<td>4&lt;sup&gt;th&lt;/sup&gt;</td>
<td>36 (13.1%)</td>
</tr>
<tr>
<td>Not in my top 4</td>
<td>97 (35.3%)</td>
</tr>
<tr>
<td>I did not take Science</td>
<td>19 (6.9%)</td>
</tr>
</tbody>
</table>

Following on from where pupils ranked Science among their top 4 Junior Certificate subjects, they were invited to rank their Junior Certificate subjects in order of preference, with number 1 being allocated to their favourite school subject and number 12 to their least favourite subject. Figure 7.2 below indicates pupils’ preference for Science, with 56.36% rating the subject in their top five subjects, the median ranking for Science was 5.0 among both Transition Year and Junior Certificate pupils.
Table 7.5 below indicates the Transition Year pupils’ results from their Junior Certificate Science examination. These results are roughly in line with the national average, although the sample is slightly skewed towards higher grades.

<table>
<thead>
<tr>
<th>Junior Certificate Science Grade (n = 228)</th>
<th>No. of pupils (%)</th>
<th>National average % (2009 – Higher level)</th>
<th>National average % (2010 – Higher level)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>29 (12.7%)</td>
<td>9.20%</td>
<td>10.4%</td>
</tr>
<tr>
<td>B</td>
<td>85 (37.3%)</td>
<td>30.4%</td>
<td>34.8%</td>
</tr>
<tr>
<td>C</td>
<td>91 (39.9%)</td>
<td>37.7%</td>
<td>37.9%</td>
</tr>
<tr>
<td>D</td>
<td>22 (9.6%)</td>
<td>20.9%</td>
<td>15.8%</td>
</tr>
<tr>
<td>F</td>
<td>1 (0.4%)</td>
<td>0.2%</td>
<td>0.2%</td>
</tr>
</tbody>
</table>

The following Figure, Figure 7.3 compares the grades pupils achieved in their other Junior Certificate subjects with their grades in Science. 50.0% of pupils received either an ‘A’ or ‘B’ grade in Science in their Junior Certificate examination. Pupils achieved grades which are in line with, if not slightly higher than other subjects.
Pupils scored significantly higher in subjects such as Mathematics, History, C.S.PE., Art, Metalwork and Italian.
Figure 7.2: Transition Year pupils’ grades in their Junior Certificate Examination subjects (n=277).
Figure 7.4 indicates that 82.3% of pupils took Science for their Junior Certificate. This was lower than the national average (for 2009) of 89.1% (Chief Examiner 2010, p. 3). In this study, Science had the 5th highest number of enrolments, after English (89.5%), Mathematics (88.5%), Irish (84.5%), and geography (83.0%) respectively.
Figure 7.3: Transition Year pupils previous Junior Certificate Examination subjects
Pupils were asked to rate their interest in the three main Science subjects on a scale from 1 to 3, with one being the most interesting and three being the least interesting. Figure 7.5 below indicates pupils’ responses to this question.

It is clear from Figure 7.5 that pupils found Biology (79.0%) to be the most interesting Science subject, with Physics being the least interesting subject (52.6%). Chemistry was mainly neutral (50.6%). Both independent t-tests and Mann Whitney tests were conducted on the data, depending on whether it was parametric or not. When comparisons were conducted to examine the differences between Transition Year pupils and Junior Certificate pupils no significant differences were found, Junior Certificate pupils ranked the subjects similarly to the Transition Year pupils. Physics was found to be the least interesting (62.5%, $Mdn = 3.00$), Chemistry was considered neutral (56.4%, $Mdn = 2.00$), while Biology was the believed to be the most interesting Science subject (72.5%, $Mdn = 1.00$). Significant differences were reported for gender. Male pupils ($Mdn = 2.00$) were significantly more interested in Physics than female pupils ($Mdn = 3.00$) ($U = 5794.5$, $p = 0.000$, $r = -0.34$). Male pupils ($M = 2.48$, SE = 0.58) were less interested in Chemistry than female pupils ($M = 2.13$, SE = 0.50), this difference was significant $t(249.6) = 4.56$, $p = 0.000$). Female pupils ($Mdn = 1.00$) were more interested in Biology than the male pupils ($Mdn = 1.00$) ($U = 8069.5$, $p = 0.026$, $r = -0.14$).
In both the Transition Year pupil and the Junior Certificate pupil questionnaires, pupils were given a series of statements regarding Junior Certificate Science to respond to. These statements were in a five point Likert scale, scaled from strongly agree to strongly disagree. Figure 7.6 represents the Transition Year pupils’ responses to these statements.

Figure 7.5: Transition Year pupils’ responses to statements regarding Junior Certificate Science (n = 269)

As Figure 7.6 indicates, Transition Year pupils’ were mainly negative towards their experiences relating to Junior Certificate Science courses and careers in Science. These differences led the author to conduct further tests, due to the parametric nature of the data independent t-tests were conducted, and these findings are displayed in Table 7.6. When Transition Year pupils’ responses were compared to Junior Certificate pupils’ responses, significant differences were noted in all three cases. Pupils, who were doing the Junior Certificate, rather than Transition Year, were significantly more positive about Junior Certificate Science, as indicated in Table 7.6.
Table 7.6: Differences between Transition Year pupils’ and Junior Certificate pupils’ responses to Junior Certificate Science statements.

<table>
<thead>
<tr>
<th>Statement</th>
<th>Mean (Transition Year pupils)</th>
<th>Mean (Junior Certificate pupils n = 42)</th>
<th>t</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Junior Certificate Science has given me a good idea about what type of work a scientist does. (n = 267)</td>
<td>3.08</td>
<td>2.62</td>
<td>2.843</td>
<td>0.005**</td>
</tr>
<tr>
<td>Junior Certificate Science has given me a good idea about the different Science courses available at third level. (n = 269)</td>
<td>3.33</td>
<td>2.43</td>
<td>5.394</td>
<td>0.000***</td>
</tr>
<tr>
<td>From the Junior Certificate I am aware of the different types of jobs available in Science. (n = 266)</td>
<td>3.21</td>
<td>2.69</td>
<td>3.157</td>
<td>0.002**</td>
</tr>
</tbody>
</table>

7.5 The Transition Year and Transition Year Science

This section of the chapter examines the pupils’ experiences of the Transition Year and Science within the year. Figure 7.7 indicates pupils’ responses when asked why they decided to take the Transition Year. This was a free response question; however, as the author was categorising pupils’ responses recurring themes emerged. These themes were coded and analysed. The majority of pupils (33.3%) took the year because it was compulsory in their school; however, 21.8% of pupils took the year as they felt it would be an opportunity to mature, others (11.5%) felt the year would allow them a break from studying and the pressure of the standardised system.
Figure 7.6: Transition Year pupils’ reasons for taking the Transition Year (n = 261)
A wide variety of Science subjects were offered to the pupils in Transition Year. Figure 7.8 illustrates the subjects that were offered to the pupils. It is worth noting that while a wide variety of Science subjects were offered to pupils, the subjects were not offered uniformly to pupils. This will be discussed further in chapter 8.

Figure 7.8 illustrates the Science subjects the Transition Year Science pupils took in their Transition Year. The highest proportion of pupils took Biology (n = 173), with much fewer taking Physics (n = 136) and Chemistry (n = 122). Only 34.9% of pupils took a general Science taster (n = 95).

The number of practical classes per week in Transition Year Science classes was examined. There appears to be a good proportion of practical Science classes per week in the Transition Year as indicated in Table 7.7. However 15.8% of pupils have either no practical classes or less than one, on average, per week. One-way ANOVA testing indicated that these figures are significantly different (p = 0.000) to those for Junior Certificate pupils, with Transition Year pupils averaging more practical classes per week than Junior Certificate pupils.
Table 7.7: Comparison of the number of practical Science classes per week between Transition Year and Junior Certificate pupils.

<table>
<thead>
<tr>
<th></th>
<th>None (n) (%)</th>
<th>Less than One (n) (%)</th>
<th>One (n) (%)</th>
<th>Two (n) (%)</th>
<th>More than Two (n) (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Transition Year (n = 272)</strong></td>
<td>29 (10.7%)</td>
<td>14 (5.1%)</td>
<td>83 (30.5%)</td>
<td>85 (31.3%)</td>
<td>61 (22.4%)</td>
</tr>
<tr>
<td><strong>Junior Certificate (n = 40)</strong></td>
<td>9 (22.5%)</td>
<td>0 (0.0%)</td>
<td>25 (62.5%)</td>
<td>3 (7.5%)</td>
<td>3 (7.5%)</td>
</tr>
</tbody>
</table>

**7.5.1 Attitudes towards Transition Year Science**

This portion of the chapter examines pupils’ attitudes towards Transition Year Science. Table 7.8 indicates pupils’ responses to statements regarding Transition Year Science. Pupils were, primarily, neutral towards these statements, neither strongly agreeing nor disagreeing. However, when comparing Transition Year Science to Junior Certificate Science pupils were more positive. 53.9% of pupils either strongly agreed or agreed that the Transition Year Science involves more practical work than Junior Certificate Science. Similarly, 61.7% of pupils also agreed or strongly agreed that Transition Year Science is more interesting than Junior Certificate Science. A particularly large proportion (73.0%) of pupils believed that Transition Year Science was more fun than Junior Certificate Science.
Table 7.8: Transition Year pupils’ attitudes regarding statements about Transition Year Science.

<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly agree</th>
<th>Agree</th>
<th>Not Sure</th>
<th>Disagree</th>
<th>Strongly disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Party Year involves more practical work than Junior Certificate Science.</td>
<td>51 (18.7%)</td>
<td>96 (35.2%)</td>
<td>66 (24.2%)</td>
<td>42 (15.4%)</td>
<td>18 (6.6%)</td>
</tr>
<tr>
<td>Transition Year Science has given me a good idea about what type of work a scientist does.</td>
<td>22 (8.0%)</td>
<td>106 (38.5%)</td>
<td>88 (32.0%)</td>
<td>54 (19.6%)</td>
<td>5 (1.8%)</td>
</tr>
<tr>
<td>After the Transition Year I am aware of the different Science courses available at third level.</td>
<td>33 (12.1%)</td>
<td>120 (44.1%)</td>
<td>61 (22.2%)</td>
<td>52 (19.1%)</td>
<td>10 (3.7%)</td>
</tr>
<tr>
<td>Transition Year Science is more interesting than Junior Certificate Science.</td>
<td>71 (26.4%)</td>
<td>95 (35.3%)</td>
<td>71 (26.4%)</td>
<td>27 (10.0%)</td>
<td>5 (1.9%)</td>
</tr>
<tr>
<td>Transition Year Science is more fun than Junior Certificate Science.</td>
<td>96 (35.6%)</td>
<td>101 (37.4%)</td>
<td>46 (17.0%)</td>
<td>21 (7.8%)</td>
<td>6 (2.2%)</td>
</tr>
</tbody>
</table>
Pupils were asked, in a free response question, how their experience of Science at the Transition Year differed from Junior Certificate Science. Once again, the author has themed pupils’ responses into broad categories. The main themes emerging from this question are that pupils believe Transition Year Science, to involve more practical work (28.8%), to have less deadlines or stress (11.4%) and to be more interesting (9.6%) than Junior Certificate Science. However, it is worth noting that 2.7% of pupils believe that Transition Year Science is based on Leaving Certificate Science, and 5.5% of pupils believe that it is more difficult than Junior Certificate Science. Yet, pupils are mainly positive about the differences. Table 7.9 illustrates the differences more fully.
<table>
<thead>
<tr>
<th>How Transition Year Science differs to Junior Certificate Science (n = 219)</th>
<th>No. of pupils</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>More practical work</td>
<td>63</td>
<td>28.8%</td>
</tr>
<tr>
<td>There are no deadlines and no stress</td>
<td>25</td>
<td>11.4%</td>
</tr>
<tr>
<td>It is less serious and more fun</td>
<td>16</td>
<td>7.3%</td>
</tr>
<tr>
<td>More focus on the individual Science subjects</td>
<td>13</td>
<td>5.9%</td>
</tr>
<tr>
<td>I did not do Junior Certificate Science</td>
<td>13</td>
<td>5.9%</td>
</tr>
<tr>
<td>It is easier</td>
<td>12</td>
<td>5.5%</td>
</tr>
<tr>
<td>It is interesting</td>
<td>12</td>
<td>5.5%</td>
</tr>
<tr>
<td>Transition Year Science shows you a lot more aspects to Science and introduces you to careers in the area</td>
<td>9</td>
<td>4.1%</td>
</tr>
<tr>
<td>More theory and more specific</td>
<td>7</td>
<td>3.2%</td>
</tr>
<tr>
<td>It is not different to the Junior Certificate</td>
<td>7</td>
<td>3.2%</td>
</tr>
<tr>
<td>It is based on Leaving Certificate Science</td>
<td>6</td>
<td>2.7%</td>
</tr>
<tr>
<td>You are not taught out of a textbook so there are different methods of learning</td>
<td>6</td>
<td>2.7%</td>
</tr>
<tr>
<td>Junior Certificate Science is more theory based, and requires everything to be documented</td>
<td>5</td>
<td>2.3%</td>
</tr>
<tr>
<td>Junior Certificate Science is more in depth and based on rote learning, Transition Year Science is a taster of some of the more interesting aspects of Science</td>
<td>5</td>
<td>2.3%</td>
</tr>
<tr>
<td>You are able to learn about what YOU are interested in instead of what you HAVE to</td>
<td>4</td>
<td>1.8%</td>
</tr>
<tr>
<td>There is less practical work</td>
<td>4</td>
<td>1.8%</td>
</tr>
<tr>
<td>It is the same as the Junior Certificate with more detail</td>
<td>2</td>
<td>0.9%</td>
</tr>
<tr>
<td>More difficult with less practical work</td>
<td>2</td>
<td>0.9%</td>
</tr>
<tr>
<td>It is more difficult</td>
<td>2</td>
<td>0.9%</td>
</tr>
<tr>
<td>Harder due to the lack of structure and no text book</td>
<td>1</td>
<td>0.5%</td>
</tr>
<tr>
<td>It is the same as the Junior Certificate, but with less practical work</td>
<td>1</td>
<td>0.5%</td>
</tr>
<tr>
<td>It is better</td>
<td>1</td>
<td>0.5%</td>
</tr>
<tr>
<td>There is more opportunity to express yourself in the Transition Year</td>
<td>1</td>
<td>0.5%</td>
</tr>
<tr>
<td>There are more everyday life issues</td>
<td>1</td>
<td>0.5%</td>
</tr>
</tbody>
</table>
Overall, pupils enjoy their Transition Year Science class as shown in Figure 7.10. This is also true for Junior Certificate pupils in their Science classes. Due to the non-parametric nature of this data the median was used as the measure of centrality, and Mann Whitney tests were conducted in order to compare the differences between the groups. When Transition Year pupils’ enjoyment of their Science class were compared with Junior Certificate pupils’ enjoyment of their Science class there were no significant differences ($p = 0.963$), and a reported median value of 2.00 for both groups. These results were also true for both male and female pupils, with both equally enjoying their Transition Year Science class ($Mdn = 2.00$, $p = 0.716$). This indicates that the majority of pupils enjoy their Science class, regardless of the year they are in.

Figure 7.8: Transition Year pupils’ enjoyment of their Transition Year Science class (n = 276).
In order to ascertain a better understanding of the pupils reasoning, they were asked why they (n = 201) enjoyed or did not enjoy their Transition Year Science class. Table 7.10 illustrates the reasons cited by pupils for their enjoyment, or in some cases lack of enjoyment of their Transition Year Science class. Reasons for enjoyment of Transition Year Science were mostly cited as those which involve its practical, interesting or ‘fun’ nature (38.5%). Nevertheless, many pupils did not appear to have enjoyed their Transition Year Science class. Reasons given were mainly to do with pupils finding the subject boring, having a lack of interest in or dislike for the physical sciences (20.0%).
Table 7.10: Why pupils enjoy or do not enjoy their Transition Year Science class (n = 201).

<table>
<thead>
<tr>
<th>Reason for enjoyment of Transition Year Science class</th>
<th>No. of pupils</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fun activities</td>
<td>20</td>
<td>10.0</td>
</tr>
<tr>
<td>I like the practical work</td>
<td>18</td>
<td>9.0</td>
</tr>
<tr>
<td>I enjoy it</td>
<td>17</td>
<td>8.5</td>
</tr>
<tr>
<td>It was interesting</td>
<td>17</td>
<td>8.5</td>
</tr>
<tr>
<td>Sometimes it is fun, and other times it is boring</td>
<td>14</td>
<td>7.0</td>
</tr>
<tr>
<td>It is boring</td>
<td>10</td>
<td>5.0</td>
</tr>
<tr>
<td>Did not like the Physics and Chemistry element</td>
<td>9</td>
<td>4.5</td>
</tr>
<tr>
<td>I do not like Science</td>
<td>9</td>
<td>4.5</td>
</tr>
<tr>
<td>Not interesting</td>
<td>8</td>
<td>4.0</td>
</tr>
<tr>
<td>The teacher is good</td>
<td>8</td>
<td>4.0</td>
</tr>
<tr>
<td>I enjoyed the projects and experiments</td>
<td>8</td>
<td>4.0</td>
</tr>
<tr>
<td>It is fun and interesting</td>
<td>7</td>
<td>3.5</td>
</tr>
<tr>
<td>I do not like Physics</td>
<td>7</td>
<td>3.5</td>
</tr>
<tr>
<td>Not enough practical work</td>
<td>5</td>
<td>2.5</td>
</tr>
<tr>
<td>Hard work and mostly taking down notes</td>
<td>5</td>
<td>2.5</td>
</tr>
<tr>
<td>A lot of theory</td>
<td>5</td>
<td>2.5</td>
</tr>
<tr>
<td>I now know more about Science</td>
<td>5</td>
<td>2.5</td>
</tr>
<tr>
<td>We don't do much of anything</td>
<td>5</td>
<td>2.5</td>
</tr>
<tr>
<td>I enjoy Biology</td>
<td>3</td>
<td>1.5</td>
</tr>
<tr>
<td>It is the same as Junior Certificate Science</td>
<td>3</td>
<td>1.5</td>
</tr>
<tr>
<td>I find it difficult</td>
<td>3</td>
<td>1.5</td>
</tr>
<tr>
<td>It gave me a great experience with good trips</td>
<td>3</td>
<td>1.5</td>
</tr>
<tr>
<td>It is not too difficult</td>
<td>2</td>
<td>1.0</td>
</tr>
<tr>
<td>I am less focused after the Transition Year</td>
<td>2</td>
<td>1.0</td>
</tr>
<tr>
<td>There was a bad teacher</td>
<td>2</td>
<td>1.0</td>
</tr>
<tr>
<td>It is fun, with something different each day</td>
<td>1</td>
<td>.5</td>
</tr>
<tr>
<td>I would like to pursue Science when I leave school</td>
<td>1</td>
<td>.5</td>
</tr>
<tr>
<td>It is easier to learn when doing, rather than just reading</td>
<td>1</td>
<td>.5</td>
</tr>
<tr>
<td>There were a lot of visiting speakers</td>
<td>1</td>
<td>.5</td>
</tr>
<tr>
<td>We only do writing</td>
<td>1</td>
<td>.5</td>
</tr>
<tr>
<td>I do not understand Science</td>
<td>1</td>
<td>.5</td>
</tr>
</tbody>
</table>
The author sought to investigate the range of teaching and learning activities that pupils were experiencing in their Transition Year Science classroom, and how this compared to a more traditional Junior Certificate Science class. Table 7.11 illustrates the range and frequency of activities experienced by the Transition Year pupils.
<table>
<thead>
<tr>
<th>Type of Activity</th>
<th>Often n</th>
<th>%</th>
<th>Sometimes n</th>
<th>%</th>
<th>Rarely n</th>
<th>%</th>
<th>Never n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Writing in your Science workbook/practical copy</td>
<td>90</td>
<td>33.1</td>
<td>63</td>
<td>23.2</td>
<td>68</td>
<td>25.0</td>
<td>51</td>
<td>18.8</td>
</tr>
<tr>
<td>Answering questions from your Science textbook</td>
<td>20</td>
<td>7.4</td>
<td>40</td>
<td>14.7</td>
<td>70</td>
<td>25.7</td>
<td>142</td>
<td>52.2</td>
</tr>
<tr>
<td>Listening to the teacher talk about topics</td>
<td>198</td>
<td>73.1</td>
<td>53</td>
<td>19.6</td>
<td>18</td>
<td>6.6</td>
<td>2</td>
<td>0.7</td>
</tr>
<tr>
<td>Reading from a Science text book</td>
<td>28</td>
<td>10.3</td>
<td>41</td>
<td>15.1</td>
<td>68</td>
<td>25.0</td>
<td>135</td>
<td>49.6</td>
</tr>
<tr>
<td>Having discussions about Science</td>
<td>177</td>
<td>43.5</td>
<td>94</td>
<td>34.9</td>
<td>45</td>
<td>16.7</td>
<td>12</td>
<td>4.5</td>
</tr>
<tr>
<td>Watching the teacher use apparatus to demonstrate ideas</td>
<td>95</td>
<td>34.9</td>
<td>122</td>
<td>44.9</td>
<td>43</td>
<td>15.8</td>
<td>12</td>
<td>4.4</td>
</tr>
<tr>
<td>Working yourself with apparatus/materials</td>
<td>132</td>
<td>48.5</td>
<td>92</td>
<td>33.6</td>
<td>84</td>
<td>31.3</td>
<td>62</td>
<td>23.1</td>
</tr>
<tr>
<td>Doing project work</td>
<td>103</td>
<td>38.1</td>
<td>100</td>
<td>37.0</td>
<td>50</td>
<td>18.5</td>
<td>17</td>
<td>6.3</td>
</tr>
<tr>
<td>Doing group work</td>
<td>153</td>
<td>56.5</td>
<td>95</td>
<td>35.1</td>
<td>19</td>
<td>7.0</td>
<td>4</td>
<td>1.5</td>
</tr>
<tr>
<td>Having pupil presentations</td>
<td>41</td>
<td>15.2</td>
<td>50</td>
<td>18.6</td>
<td>93</td>
<td>34.6</td>
<td>85</td>
<td>31.6</td>
</tr>
<tr>
<td>Having debates</td>
<td>17</td>
<td>6.3</td>
<td>29</td>
<td>10.7</td>
<td>91</td>
<td>33.7</td>
<td>133</td>
<td>49.3</td>
</tr>
<tr>
<td>Watching T.V./DVDs/Videos on scientific phenomena</td>
<td>37</td>
<td>13.7</td>
<td>103</td>
<td>38.1</td>
<td>82</td>
<td>30.4</td>
<td>48</td>
<td>17.8</td>
</tr>
<tr>
<td>Using a computer</td>
<td>56</td>
<td>20.7</td>
<td>100</td>
<td>37.0</td>
<td>67</td>
<td>24.8</td>
<td>47</td>
<td>17.4</td>
</tr>
<tr>
<td>Using the internet</td>
<td>57</td>
<td>21.0</td>
<td>94</td>
<td>34.6</td>
<td>67</td>
<td>24.6</td>
<td>54</td>
<td>19.9</td>
</tr>
<tr>
<td>Going on field trips</td>
<td>13</td>
<td>4.8</td>
<td>39</td>
<td>14.4</td>
<td>61</td>
<td>22.5</td>
<td>158</td>
<td>58.3</td>
</tr>
<tr>
<td>Visiting industry or scientific businesses</td>
<td>5</td>
<td>1.8</td>
<td>12</td>
<td>4.4</td>
<td>38</td>
<td>14.0</td>
<td>217</td>
<td>79.8</td>
</tr>
<tr>
<td>Listening to visiting speakers</td>
<td>64</td>
<td>23.6</td>
<td>43</td>
<td>15.9</td>
<td>43</td>
<td>15.9</td>
<td>21</td>
<td>44.6</td>
</tr>
<tr>
<td>Attending seminars</td>
<td>13</td>
<td>4.9</td>
<td>31</td>
<td>11.6</td>
<td>52</td>
<td>19.4</td>
<td>172</td>
<td>64.2</td>
</tr>
<tr>
<td>Having written tests</td>
<td>23</td>
<td>8.5</td>
<td>78</td>
<td>28.8</td>
<td>63</td>
<td>23.2</td>
<td>107</td>
<td>39.5</td>
</tr>
<tr>
<td>Having oral tests</td>
<td>15</td>
<td>5.6</td>
<td>36</td>
<td>13.3</td>
<td>74</td>
<td>27.4</td>
<td>145</td>
<td>53.7</td>
</tr>
<tr>
<td>Work Experience</td>
<td>22</td>
<td>8.4</td>
<td>53</td>
<td>20.3</td>
<td>39</td>
<td>14.9</td>
<td>147</td>
<td>56.3</td>
</tr>
<tr>
<td>Taking part in activities such as SciFest, BT Young Scientist, Science Fairs etc.</td>
<td>44</td>
<td>16.9</td>
<td>54</td>
<td>20.8</td>
<td>44</td>
<td>16.9</td>
<td>118</td>
<td>45.4</td>
</tr>
</tbody>
</table>
In line with Transition Year guidelines, pupils rarely or never do activities such as writing in (43.8 %), answering questions from (77.9%), or reading from (74.6%) their Science text book. Practical activities, such as working with apparatus or materials (82.3%), carrying out experiments (83.8%), completing project (75.1%) and group work (91.6%) were all experienced often or sometimes by the pupils. However, activities central to the development of communication skills, scientific literacy and critical thinking in Science, such as having pupil presentations (66.2%), and debates (83.0%) and taking part in activities such as the BT Young Scientist, SciFest or Science Fairs (63.2%) were all experienced rarely or never. Activities, such as visiting scientific industry (80.8%), going on field trips (80.8%), listening to visiting speakers (60.5%), or attending seminars (83.6%) which would allow pupils a deeper insight into the everyday context of Science and the various types of jobs available in the areas were also rarely or never experienced.

However, when the frequency of Transition Year pupils’ experiences of these activities were compared, using Chi-square tests, with the Junior Certificate pupils some significant differences were noticed as indicated in Table 7.12.
### Table 7.12: Differences in types of activities in the Science classroom between Transition Year and Junior Certificate pupils.

<table>
<thead>
<tr>
<th>Type of Activity</th>
<th>p-value</th>
<th>Pupils who experiences the activities most frequently</th>
</tr>
</thead>
<tbody>
<tr>
<td>Writing in your Science workbook/practical copy</td>
<td>0.001***</td>
<td>Junior Certificate</td>
</tr>
<tr>
<td>Answering questions from your Science text book</td>
<td>0.000***</td>
<td>Junior Certificate</td>
</tr>
<tr>
<td>Listening to the teacher talk about topics</td>
<td>0.496</td>
<td>Junior Certificate</td>
</tr>
<tr>
<td>Reading from a Science text book</td>
<td>0.000***</td>
<td>Junior Certificate</td>
</tr>
<tr>
<td>Having discussions about Science</td>
<td>0.806</td>
<td>Transition Year</td>
</tr>
<tr>
<td>Watching the teacher use apparatus to demonstrate ideas</td>
<td>0.583</td>
<td>Transition Year</td>
</tr>
<tr>
<td>Working yourself with apparatus/materials</td>
<td>0.016*</td>
<td>Transition Year</td>
</tr>
<tr>
<td>Doing calculations</td>
<td>0.001***</td>
<td>Junior Certificate</td>
</tr>
<tr>
<td>Carrying out experiments</td>
<td>0.075</td>
<td>Transition Year</td>
</tr>
<tr>
<td>Doing project work</td>
<td>0.239</td>
<td>Transition Year</td>
</tr>
<tr>
<td>Doing group work</td>
<td>0.000***</td>
<td>Transition Year</td>
</tr>
<tr>
<td>Having pupil presentations</td>
<td>0.003**</td>
<td>Transition Year</td>
</tr>
<tr>
<td>Having debates</td>
<td>0.280</td>
<td>Transition Year</td>
</tr>
<tr>
<td>Watching T.V./DVDs/Videos on scientific phenomena</td>
<td>0.000***</td>
<td>Transition Year</td>
</tr>
<tr>
<td>Using a computer</td>
<td>0.000***</td>
<td>Transition Year</td>
</tr>
<tr>
<td>Using the internet</td>
<td>0.000***</td>
<td>Transition Year</td>
</tr>
<tr>
<td>Going on field trips</td>
<td>0.001***</td>
<td>Junior Certificate</td>
</tr>
<tr>
<td>Visiting industry or scientific businesses</td>
<td>0.177</td>
<td>Junior Certificate</td>
</tr>
<tr>
<td>Listening to visiting speakers</td>
<td>0.001***</td>
<td>Transition Year</td>
</tr>
<tr>
<td>Attending seminars</td>
<td>0.284</td>
<td>Junior Certificate</td>
</tr>
<tr>
<td>Having written tests</td>
<td>0.000***</td>
<td>Junior Certificate</td>
</tr>
<tr>
<td>Having oral tests</td>
<td>0.000***</td>
<td>Junior Certificate</td>
</tr>
<tr>
<td>Work Experience</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>Taking part in activities such as SciFest, BT Young Scientist, Science Fairs etc.</td>
<td>0.000***</td>
<td>Transition Year</td>
</tr>
</tbody>
</table>

Significance levels: *p< 0.05, ** p<0.01, ***p<0.001
Table 7.12 clearly indicates that Junior Certificate pupils experience more ‘traditional’ activities in their Science classes. Transition Year pupils appear to have their Science classes supplemented with more access to resources and slightly less traditional teaching and learning techniques. Traditional assessment techniques are also experienced less frequently by Transition Year pupils. Transition Year pupils have significantly more experiences of general practical activities, when compared to the Junior Certificate group. Transition Year pupils also carry out experiments with more frequency than their Junior Certificate counterparts, though there is not a significant difference.

7.6 Careers and Career Guidance

This section of this chapter focuses on the pupils’ experiences of career guidance in their schools, and the influences on their lives regarding their career decisions.

A high percentage of Transition Year pupils (98.9%) have a career guidance teacher in their schools. A slightly lesser proportion of Junior Certificate pupils (85.4%) have a career guidance teacher in their schools. Although Chi-square testing showed these differences to be statistically significant (p<0.05), this has been discounted due to the small sample size. 60.4% of Transition Year pupils were given information on careers in Science, and 39.6% were not given information on careers in Science. Once again a large proportion of Junior Certificate pupils (57.9%) were not given information on careers in Science and this difference was found to be significant ($\chi^2$ (1) = 4.109, $p = 0.043$).

Figure 7.10 illustrates pupils’ sources of information on careers in Science. It is clearly indicated that pupils’ primary sources of information on careers in Science are their Science and career guidance teachers.
CHAPTER 7: PUPIL RESULTS

The other sources of information that pupils mentioned were the internet (4.33%), work experience in the area (2.53%), a sibling (0.72%), or leaflets in the school (0.72%). When Chi-square testing was carried out, a significantly higher proportion of Transition Year pupils received their information from their Science teacher ($p = 0.016$), when compared to the Junior Certificate pupils. Similar results were found when comparisons on receiving information from parents were conducted between the two groups ($p = 0.001$). This was also true for pupils receiving information from visiting speakers. No such differences were found between male and female pupils.

Figure 7.11 suggests that Transition Year pupils received a wide variety of career guidance. However further comparisons indicated wide gaps exist between the levels of guidance received by the Junior Certificate pupils and the Transition Year pupils.

Figure 7.9: Sources of information on careers in Science for Transition Year pupils (n = 277)
Figure 7.10: Types of career guidance offered to Transition Year pupils (n = 277)

Chi-square testing indicated statistically significant differences exist between the Junior Certificate and the Transition Year pupils. These differences were considered quite substantial, and are outlined in Table 7.13.

Table 7.13: Differences in types of career guidance offered to Transition Year and Junior Certificate pupils.

<table>
<thead>
<tr>
<th>Type of Career Guidance</th>
<th>Transition Year pupils (n = 277)</th>
<th>Junior Certificate pupils (n = 42)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aptitude test</td>
<td>144 (52.0%)</td>
<td>32 (76.2%)</td>
<td>0.003**</td>
</tr>
<tr>
<td>Chat about career options</td>
<td>180 (65.0%)</td>
<td>14 (33.3%)</td>
<td>0.000***</td>
</tr>
<tr>
<td>Information on specific careers</td>
<td>112 (40.4%)</td>
<td>4 (9.5%)</td>
<td>0.000***</td>
</tr>
<tr>
<td>Information on specific courses</td>
<td>116 (42.3%)</td>
<td>4 (9.5%)</td>
<td>0.000***</td>
</tr>
<tr>
<td>Guidance on subject choice</td>
<td>172 (62.1%)</td>
<td>14 (33.3%)</td>
<td>0.000***</td>
</tr>
</tbody>
</table>

Significance levels: *p<0.05, **p<0.01, ***p<0.001
A statistically significant proportion of Junior Certificate pupils received career guidance in the form of aptitude tests, when compared with Transition Year pupils. However, this is the only area where the Junior Certificate pupils received more guidance than the Transition Year pupils, as indicated in Table 7.13 above.

All pupils were also asked how useful their career guidance sessions were. Figure 7.12 indicates that overall the Transition Year pupils found the sessions to be useful with 50.9% either agreeing or strongly agreeing that the sessions were useful, compared to 35.1% of Junior Certificate pupils. Due to the parametric nature of the overall data independent t-tests were conducted in order to compare the groups of pupils. The career guidance sessions were deemed significantly more useful for the Transition Year pupils ($M = 2.73$, $SE = 0.07$, $t(43.5) = -2.405$, $p = 0.020$) when compared to the Junior Certificate pupils ($M= 3.32$, $SE = 0.24$). No significant differences were found between the male and female pupils.

Figure 7.11: Summary of the usefulness of the career guidance sessions for Transition Year pupils ($n = 255$)
The key influences on pupils when they are deciding what subjects to take for their Leaving Certificate were examined. These results are shown in Figure 7.13 below. Parents were the primary influences for the pupils, followed by their career guidance teacher and their friends. Median values were used as the measure of centrality in some instances, as some of the data was non-parametric. In the case of parametric data the mean was taken as the measure of centrality.

![Influence of individuals in pupils' life on what subjects to take at Leaving Certificate](image)

Figure 7.12: Influences for pupils’ decisions on what subjects to take for the Leaving Certificate.

Independent t-tests were run to analyse the parametric data, and compare the differences between the groups. The non-parametric data was analysed and groups were compared using Mann Whitney tests. Statistically significant findings were found in some instances. Mothers were found to be slightly more influential; for Transition Year pupils ($Mdn = 2.0$), when compared with the Junior Certificate pupils ($Mdn = 3.0$), but this was not found to be a statistically significant difference. The only significant difference between Transition Year pupils ($n = 271$) and Junior Certificate pupils ($n = 39$) was that Transition Year pupils ($M = 3.06$, $SE = 0.7$, $p =$
0.014) were more strongly influenced by their friends than the Junior Certificate pupils (M = 3.54, SE = 0.17). When the pupils’ gender was examined it was found that fathers were more influential for male pupils (M = 2.80, SE = 0.11, p = 0.037) than for female pupils (M = 3.11, SE = 0.10). The influence of the school principal was also found to be less influential for female pupils (Mdn = 5.00) than for male pupils (Mdn = 4.00, U = 6384.5, p < 0.001, r = -0.25).

### 7.7 Future Study of Science

In the questionnaire pupils were asked in two sections about their future study of Science (see Appendix I). Initially pupils were asked to list the Science subjects that they planned to study for their Leaving Certificate, and the responses to this are listed in Table 7.14.

<table>
<thead>
<tr>
<th>Subjects for the Leaving Certificate</th>
<th>Plan to take this subject</th>
<th>Do not plan to take this subject</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number of pupils (%)</td>
<td>Number of pupils (%)</td>
</tr>
<tr>
<td>Biology</td>
<td>183 (66.1%)</td>
<td>94 (33.9%)</td>
</tr>
<tr>
<td>Physics</td>
<td>42 (15.2%)</td>
<td>235 (84.8%)</td>
</tr>
<tr>
<td>Chemistry</td>
<td>43 (15.5%)</td>
<td>234 (84.5%)</td>
</tr>
<tr>
<td>Agricultural Science</td>
<td>19 (6.9%)</td>
<td>258 (93.1%)</td>
</tr>
<tr>
<td>Physics &amp; Chemistry</td>
<td>0 (0.0%)</td>
<td>277 (100.0%)</td>
</tr>
<tr>
<td>Mathematics</td>
<td>261 (94.2%)</td>
<td>16 (5.8%)</td>
</tr>
</tbody>
</table>

These responses were compared with those of the Junior Certificate pupils through Chi-square tests. It was found that a significantly (χ² (1) = 6.811, p = 0.009) higher proportion of Transition Year pupils (66.1%) planned to study Biology for their Leaving Certificate, when compared to the Junior Certificate pupils (45.2%). A slightly greater proportion of Transition Year pupils (15.2%) plan to take Leaving Certificate Physics, whereas only 14.3% of the Junior Certificate pupils plan to take this subject. This finding is not statistically significant (χ² (1) = 0.022, p = 0.882). However, these results are not mirrored in the planned uptake of the other Science...
A greater percentage of Junior Certificate pupils intend to take Leaving Certificate Chemistry (26.2%), than the Transition Year pupils (15.5%), this difference is not significant ($\chi^2 (1) = 2.951, p = 0.086$). A statistically significant ($\chi^2 (1) = 6.993, p = 0.015$) percentage of Junior Certificate pupils (19.1%) plan to take Agricultural Science, when compared with the 6.9% of Transition Year pupils who plan to take the subject.

Comparisons between the genders also indicated some significant differences. Statically significant ($\chi^2 (1) = 12.717, p = 0.000$) percentages of female pupils (75.0%) are planning to take Biology for their Leaving Certificate, when compared to male pupils (54.5%). This trend is also true for Chemistry, though not significantly so ($\chi^2 (1) = 0.867, p = 0.352$). 17.3% of female pupils plan to take the subject at Leaving Certificate, while only 13.2% of male pupils intend to take it. The trend is reversed for Physics and Agricultural Science. A significantly ($\chi^2 (1) = 12.948, p = 0.000$) higher proportion of male pupils (24.0%) plan to take Physics for their Leaving Certificate. Only 7.69% of female pupils plan to take the subject. The trend is present for Agricultural Science, though not significantly so ($\chi^2 (1) = 1.675, p = 0.196$), with 9.09% of male pupils planning on taking the subject at Leaving Certificate, but only 5.13% of female pupils indicating that they plan to do the same. Physics & Chemistry is not discussed, as the sample planning to take this subject is too small to perform any meaningful statistical tests on.

The second question relating to what Science subjects pupils planned to take at Leaving Certificate was not free response. Pupils were invited to tick the box which best suited their response to each Science subject and to provide an explanation as to why they intended to take or not take the subject. Figure 7.14 below indicates pupils’ responses to whether they planned to take the subjects, and whether it was offered in their school. Whether or not the subject was offered in the pupils’ school has already been reported in more detail in chapter 5.
Evidently, once again the majority of pupils plan to take Biology for their Leaving Certificate. A slightly higher proportion of pupils (71.6%) indicated that they plan to take this subject in response to this question, than in the previous free response question (66.1%). It is worth noting that Biology is the only Science subject to be offered to pupils in every school surveyed. Results between the Transition Year pupils and the Junior Certificate pupils and the genders were once again compared in Chi-square tests. Similarly to the previous results discussed, Biology was the only Science subject that a significantly higher proportion of Transition Year pupils planned to take for their Leaving Certificate (71.6%). Only 55.3% of Junior Certificate pupils planned to take this subject, and this difference was considered to be statistically significant ($\chi^2 (2)= 5.202$, $p = 0.023$). Physics shows similar trends to the previous results, more Transition Year pupils (18.0%) plan to study the subject than Junior Certificate pupils (14.6%), but this difference is not statistically significant.

A significantly ($p = 0.001$) higher proportion of Junior Certificate pupils (29.3%) planned to take Chemistry, 17.7% of Transition Year pupils indicated that they planned to take the subject. A greater proportion of Junior Certificate pupils (35.0%)
planned to take Agricultural Science than their Transition Year counterparts (11.5%), but this is not significant.

The trends for gender from the responses to the free response question carry through here also. Biology has a significantly ($p = 0.001$) higher proportion of female pupils planning to take the subject, while Chemistry also experiences this, but not significantly. Once again, the proportion of male pupils (29.8%) planning to study Physics for the Leaving Certificate is significantly ($p = 0.003$) higher than the percentage of female pupils (13.2%) planning to take the subject. Agricultural Science also shows this trend, but not significantly so. Once again Physics & Chemistry is not discussed as the sample planning to take this subject is too small to perform any meaningful statistical tests on.

Figure 7.15, indicates the levels that pupils plan to take the various Science subjects at. Figure 7.15 clearly indicates that the vast majority of pupils who plan to take a Science subject at Leaving Certificate level plan to take the subject at higher level.

![Figure 7.14: The subject level pupils plan to take Science subjects at for their Leaving Certificate.](image)
When Transition Year pupils are compared with the Junior Certificate pupils, through Chi-square testing, it is noted that there are no significant differences, except in Agricultural Science. A significantly ($\chi^2 (2) = 8.652, p = 0.008$) higher proportion of Transition Year pupils (78.6%) plan to take the subject at higher level, when compared to the Junior Certificate pupils (21.4%). When gender was examined, no significant differences were found.

Tables 7.15 and 7.16 illustrate pupils’ reasons for planning to take or not take the various Science subjects for their Leaving Certificate. The responses illustrated in these two tables stem from pupils’ responses to free response questions, however, as the author was analysing the questionnaires, recurring trends presented themselves, and pupils’ responses have been coded under these broad categories. Physics & Chemistry has not been examined, as there were no responses for this subject.

The pupils who are planning to take one or more of the various Science subjects cited various reasons for their decision. Pupils who are planning to take Physics are doing so because they are interested in it (30.3%), they need it for their college career (27.3%) and they like it (18.2%). Similar results for Chemistry show that 30.0% need the subject for their college career, 27.5% of pupils are interested in it and 25.0% like the subject. Fewer pupils taking Biology are doing so for their future career (18.4%), the main reasons for taking this subject are interest (34.0%), liking (14.3%) and enjoyment (17.0%). Pupils planning to study Agricultural Science believed that it was the easiest Science subject, and this was a reason for choosing the subject (21.4%), as was a belief that it would be easy to achieve high points in (14.3%). Other reasons cited were similar to the other Science subjects, such as needing it for a college course or career (14.3%), liking the subject (21.4%), interest in the subject (21.4%).
Table 7.15: Pupils’ reasons for taking Science subjects for their Leaving Certificate

<table>
<thead>
<tr>
<th>Reasons for taking the subject</th>
<th>Physics No. of pupils (%)</th>
<th>Chemistry No. of pupils (%)</th>
<th>Biology No. of pupils (%)</th>
<th>Agricultural Science No. of pupils (%)</th>
<th>Physics &amp; Chemistry No. of pupils (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interest in the subject</td>
<td>10 (30.3%)</td>
<td>11 (27.5%)</td>
<td>50 (34.0%)</td>
<td>3 (21.4%)</td>
<td>N/A</td>
</tr>
<tr>
<td>Liking the subject</td>
<td>7 (21.2%)</td>
<td>10 (25.0%)</td>
<td>24 (16.3%)</td>
<td>3 (21.4%)</td>
<td>N/A</td>
</tr>
<tr>
<td>Enjoyment of the subject</td>
<td>4 (12.1%)</td>
<td>3 (7.5%)</td>
<td>25 (17.0%)</td>
<td>0 (0.0%)</td>
<td>N/A</td>
</tr>
<tr>
<td>Requirement for college course or future career</td>
<td>9 (27.3%)</td>
<td>12 (30.0%)</td>
<td>27 (18.4%)</td>
<td>3 (21.4%)</td>
<td>N/A</td>
</tr>
<tr>
<td>It is an easy subject, and will be easy to achieve high points in</td>
<td>1 (3.0%)</td>
<td>0 (0.0%)</td>
<td>9 (6.12%)</td>
<td>5 (35.7%)</td>
<td>N/A</td>
</tr>
</tbody>
</table>

Table 7.15 indicates that the primary factors for pupils, when deciding whether or not to take a Science subject for their Leaving Certificate was interest, liking of the subject, requirement for college course or future career and whether or not it was an easy subject.
### Table 7.16: Pupils’ reasons for not taking Science subjects for their Leaving Certificate.

<table>
<thead>
<tr>
<th>Reasons for not taking the subject</th>
<th>Physics</th>
<th>Chemistry</th>
<th>Biology</th>
<th>Agricultural Science</th>
<th>Physics &amp; Chemistry</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No. of pupils (%)</td>
<td>No. of pupils (%)</td>
<td>No. of pupils (%)</td>
<td>No. of pupils (%)</td>
<td>No. of pupils (%)</td>
</tr>
<tr>
<td>No interest in the subject</td>
<td>20 (17.9%)</td>
<td>21 (21.6%)</td>
<td>8 (25.0%)</td>
<td>18 (46.2%)</td>
<td>4 (80.0%)</td>
</tr>
<tr>
<td>The subject is too difficult</td>
<td>22 (19.6%)</td>
<td>26 (26.8%)</td>
<td>4 (12.5%)</td>
<td>2 (5.1%)</td>
<td>1 (20.0%)</td>
</tr>
<tr>
<td>Do not like the subject</td>
<td>34 (30.4%)</td>
<td>25 (25.8%)</td>
<td>7 (21.9%)</td>
<td>9 (23.1%)</td>
<td>0 (0.0%)</td>
</tr>
<tr>
<td>Do not need the subject for college course or future career</td>
<td>6 (5.4%)</td>
<td>6 (6.2%)</td>
<td>3 (9.4%)</td>
<td>2 (5.1%)</td>
<td>0 (0.0%)</td>
</tr>
<tr>
<td>Have a preference for other Science subjects</td>
<td>7 (6.3%)</td>
<td>4 (4.1%)</td>
<td>5 (15.6%)</td>
<td>4 (10.3%)</td>
<td>0 (0.0%)</td>
</tr>
</tbody>
</table>

The results presented in Table 7.16 indicate that pupils decided not to take a Science subject for reasons such as lack of interest in the subject, level of difficulty, and whether or not they liked the subject.

It is worth noting that both Table 7.15 and 7.16 indicate that pupils levels of interest, liking and enjoyment of a Science subject are the highest and primary reasons for taking Biology and Agricultural Science, whereas the reasons for taking or not taking Physics and Chemistry are also interest, liking, and whether or not the subject is required for the pupils future college course or career.

Table 5.17 illustrates pupils’ responses outlining the various factors that would encourage them to study or not study a Science subject.
Table 7.17: Factors that would encourage pupils to study a Science subject.

<table>
<thead>
<tr>
<th>Factor</th>
<th>Physics No. of pupils (%)</th>
<th>Chemistry No. of pupils (%)</th>
<th>Biology No. of pupils (%)</th>
<th>Agricultural Science No. of pupils (%)</th>
<th>Physics/Chemistry No. of pupils (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>I am interested in the subject</td>
<td>58 (20.9%)</td>
<td>55 (19.9%)</td>
<td>205 (74.0%)</td>
<td>34 (12.3%)</td>
<td>4 (1.4%)</td>
</tr>
<tr>
<td>College course requirement</td>
<td>41 (14.8%)</td>
<td>59 (21.3%)</td>
<td>130 (46.9%)</td>
<td>19 (6.9%)</td>
<td>4 (1.4%)</td>
</tr>
<tr>
<td>It is the easiest Science subject</td>
<td>5 (1.8%)</td>
<td>6 (2.2%)</td>
<td>163 (58.8%)</td>
<td>35 (12.6%)</td>
<td>1 (0.4%)</td>
</tr>
<tr>
<td>It gives me good career prospects</td>
<td>41 (14.8%)</td>
<td>57 (20.6%)</td>
<td>142 (51.3%)</td>
<td>23 (8.3%)</td>
<td>8 (2.9%)</td>
</tr>
<tr>
<td>It is a boring subject</td>
<td>133 (48.0%)</td>
<td>99 (35.7%)</td>
<td>21 (7.6%)</td>
<td>46 (16.6%)</td>
<td>34 (12.3%)</td>
</tr>
<tr>
<td>It is a difficult subject</td>
<td>147 (53.1%)</td>
<td>122 (44.0%)</td>
<td>24 (8.7%)</td>
<td>17 (6.1%)</td>
<td>35 (12.6%)</td>
</tr>
<tr>
<td>It is an useful subject</td>
<td>59 (21.3%)</td>
<td>62 (22.4%)</td>
<td>164 (59.2%)</td>
<td>25 (9.0%)</td>
<td>8 (2.9%)</td>
</tr>
<tr>
<td>It is not an interesting subject</td>
<td>97 (35.0%)</td>
<td>91 (32.9%)</td>
<td>25 (9.0%)</td>
<td>48 (17.3%)</td>
<td>42 (15.2%)</td>
</tr>
<tr>
<td>There is a good teacher</td>
<td>73 (26.4%)</td>
<td>63 (22.7%)</td>
<td>169 (61.0%)</td>
<td>34 (12.3%)</td>
<td>8 (2.9%)</td>
</tr>
</tbody>
</table>

Biology scored the highest in areas such as pupil interest in the subject, college course requirement, good career prospects, and the usefulness of the subject. Pupils also appear to believe that it is the easiest Science subject, followed by Agricultural Science, very few pupils believe that Physics or Chemistry are the easiest Science
subjects. Pupils also appear to be encouraged to study Biology if there is a good
teacher, more so than Physics or Chemistry. Physics and Chemistry are perceived to
be the most difficult, boring and uninteresting subject.

Figure 7.16 compares Junior Certificate and Transition Year pupils’ reasons for
planning to take or not take a Science subject at senior cycle.
Figure 7.15: Comparison of Junior Certificate and Transition Year pupils’ reasons for taking or not taking Science subjects at senior cycle.
The pupils’ exhibit many of the same reasons for deciding to take or not take a Science subject at Leaving Certificate. Interestingly the Transition Year pupils are slightly more inclined to mention negative factors about the Physical Sciences, such as the subjects are ‘boring’, ‘uninteresting’, and ‘difficult’. Table 7.18 indicates the significance (Chi-square testing) of the differences illustrated in Figure 7.16.

Table 7.18: Significant differences between the cohort of Transition Year and Junior Certificate pupils, among the factors that would encourage or discourage them to take a Science subjects for their senior cycle.

<table>
<thead>
<tr>
<th>Factor</th>
<th>Physics p-value</th>
<th>Chemistry p-value</th>
<th>Biology p-value</th>
<th>Agricultural Science p-value</th>
<th>Physics/Chemistry p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>I am interested in the subject</td>
<td>0.778</td>
<td>0.048*</td>
<td>0.008**</td>
<td>0.000***</td>
<td>0.051</td>
</tr>
<tr>
<td>College course requirement</td>
<td>0.619</td>
<td>0.163</td>
<td>0.024*</td>
<td>0.015*</td>
<td>1.000</td>
</tr>
<tr>
<td>It is the easiest Science subject</td>
<td>0.223</td>
<td>0.316</td>
<td>0.268</td>
<td>0.025*</td>
<td>1.000</td>
</tr>
<tr>
<td>It gives me good career prospects</td>
<td>0.477</td>
<td>0.000***</td>
<td>0.112</td>
<td>0.045*</td>
<td>0.018*</td>
</tr>
<tr>
<td>It is a boring subject</td>
<td>0.136</td>
<td>0.004**</td>
<td>0.716</td>
<td>0.253</td>
<td>0.608</td>
</tr>
<tr>
<td>It is a difficult subject</td>
<td>0.207</td>
<td>0.058</td>
<td>0.785</td>
<td>0.499</td>
<td>0.894</td>
</tr>
<tr>
<td>It is an useful subject</td>
<td>0.738</td>
<td>0.060</td>
<td>0.046</td>
<td>0.000***</td>
<td>0.018*</td>
</tr>
<tr>
<td>It is not an interesting subject</td>
<td>0.605</td>
<td>0.034*</td>
<td>0.782</td>
<td>0.310</td>
<td>0.801</td>
</tr>
<tr>
<td>There is a good teacher</td>
<td>0.423</td>
<td>0.135</td>
<td>0.288</td>
<td>0.000***</td>
<td>0.018*</td>
</tr>
</tbody>
</table>

Significance levels: *p<0.05, **p<0.01, ***p<0.001
Table 7.18 displays interesting differences between the two cohorts of pupils. Junior Certificate pupils display significantly more positive views around Chemistry as an interesting subject, strongly believing that it ‘gives good career prospects’. The Junior Certificate pupils are also more positive about Physics. On the other hand Transition Year pupils are negative about the Physical Sciences, believing Chemistry to be boring, uninteresting and difficult. These pupils are significantly more positive about Biology, and Agricultural Science.

Over all Transition Year does not appear to overwhelmingly encourage or discourage pupils to take a Science subject for their Leaving Certificate, with only 49.8% of pupils stating that the year has encouraged them to take up a Science subject for the Leaving Certificate, as indicated in Figure 7.17.

![Figure: 7.16: Has the Transition Year encouraged pupils to take up Science for the Leaving Certificate (n = 269)](image)

When Chi-square tests were performed, examining the effect of pupils’ gender it was found that female pupils are significantly ($\chi^2 (1) = 6.075, p = 0.014$) more encouraged by the Transition Year to take up a Science subject for the Leaving Certificate: 57.8% of female pupils stated that the Transition Year had encouraged
them to take up a Science subject for the Leaving Certificate, compared to 42.6% of male pupils.

Figure 7.18 indicates that the pupils who felt that the Transition Year had encouraged them to take up a Science subject for the Leaving Certificate had a higher planned uptake of Physics, Chemistry and Biology than those who had not been encouraged to take a subject by the Transition Year. These differences were tested; using Chi-square tests, and were found to be significant for the three primary Science subjects ($p < 0.05$). There was a significant association between whether or not the Transition Year had encouraged pupils to take a Science subject for the Leaving Certificate and them deciding to take one. A significantly greater proportion of pupils who said that the Transition Year had encouraged them planned to take Physics ($\chi^2 (1) = 6.274$, $p = 0.012$) for their Leaving Certificate than those who noted that the year had not encouraged them. The same trend was found for both Chemistry ($\chi^2 (1) = 3.910$, $p = 0.048$) and Biology ($\chi^2 (1) = 16.617$, $p = 0.000$). Mann-Whitney testing ($U = 11783.5$, $p = 0.000$) also found that pupils who had enjoyed their Science class were more likely to state that the Transition Year had encouraged them to take a Science subject for their Leaving Certificate.
Figure 7.17: Pupils’ planned uptake of Science subjects for Leaving Certificate by whether the Transition Year had encouraged them to take Science for Leaving Certificate.

Following on from whether the Transition Year had encouraged pupils to take a Science subject for their Leaving Certificate, it was decided to explore the reasons how it had encouraged the pupils. The responses in Tables 7.19 and 7.20 have been categorised from pupils’ free responses when asked to explain how the Transition Year had or had not encouraged them to take Science for their Leaving Certificate. The pupils’ responses were the split into two further categories, those who had stated that taking the year encouraged them to take a Science subject, and those who said it had not.
Table 7.19: Summary of ways in which the Transition Year has encouraged pupils, who said the year had encouraged them, to take up a Science subject for their Leaving Certificate.

<table>
<thead>
<tr>
<th>How the Transition Year has encouraged pupils to take up Science for the Leaving Certificate. (pupils who said Transition Year had encouraged them) (n=119)</th>
<th>No. of pupils</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>I like Biology now</td>
<td>22</td>
<td>18.5</td>
</tr>
<tr>
<td>It made me more interested</td>
<td>16</td>
<td>13.4</td>
</tr>
<tr>
<td>Taste of subjects for the Leaving Certificate</td>
<td>13</td>
<td>10.9</td>
</tr>
<tr>
<td>Taste of subjects for the Leaving Certificate</td>
<td>13</td>
<td>10.9</td>
</tr>
<tr>
<td>I need it for the course I want to do</td>
<td>10</td>
<td>8.4</td>
</tr>
<tr>
<td>I enjoyed it</td>
<td>10</td>
<td>8.4</td>
</tr>
<tr>
<td>Biology is interesting</td>
<td>7</td>
<td>5.9</td>
</tr>
<tr>
<td>I now know more about Science</td>
<td>5</td>
<td>4.2</td>
</tr>
<tr>
<td>It gave me an insight into what a career in Science would be like</td>
<td>5</td>
<td>4.2</td>
</tr>
<tr>
<td>It has made me consider taking up Science as a career</td>
<td>4</td>
<td>3.4</td>
</tr>
<tr>
<td>I enjoyed the Science modules and it made me want to pick a Science subject</td>
<td>4</td>
<td>3.4</td>
</tr>
<tr>
<td>It helped me decide which Science subjects to take</td>
<td>4</td>
<td>3.4</td>
</tr>
<tr>
<td>It made me realise how many jobs need Science</td>
<td>4</td>
<td>3.4</td>
</tr>
<tr>
<td>Helped me to realise the importance of Science and the job opportunities in Science due to the recession</td>
<td>3</td>
<td>2.5</td>
</tr>
<tr>
<td>The fun of the classes, with different experiments and projects</td>
<td>3</td>
<td>2.5</td>
</tr>
<tr>
<td>I did not really like Science and now I do</td>
<td>2</td>
<td>1.7</td>
</tr>
<tr>
<td>There were good teachers</td>
<td>2</td>
<td>1.7</td>
</tr>
<tr>
<td>I was always going to take a Science subject</td>
<td>1</td>
<td>0.8</td>
</tr>
<tr>
<td>Too difficult</td>
<td>1</td>
<td>0.8</td>
</tr>
<tr>
<td>I was already planning on doing Biology, but after Transition Year I will do Chemistry too to leave career options open</td>
<td>1</td>
<td>0.8</td>
</tr>
<tr>
<td>It was very different to Junior Certificate Science</td>
<td>1</td>
<td>0.8</td>
</tr>
<tr>
<td>It has taught me about my subject for the Leaving Certificate and how to approach the exam</td>
<td>1</td>
<td>0.8</td>
</tr>
</tbody>
</table>
The main ways in which the Transition Year has encouraged pupils to take a Science subject for their Leaving Certificate are in acting as an introduction for Leaving Certificate Science subjects and in developing pupils’ interest in the subjects.

### Table 7.20: Summary of ways in which the Transition Year has encouraged pupils, who said the year had not encouraged them, to take up a Science subject for their Leaving Certificate

<table>
<thead>
<tr>
<th>How the Transition Year has encouraged pupils to take up Science for the Leaving Certificate. (pupils who said Transition Year had NOT encouraged them) (n = 68)</th>
<th>No. of pupils</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>I was always going to take a Science subject</td>
<td>22</td>
<td>32.4</td>
</tr>
<tr>
<td>I always intended to take Biology</td>
<td>9</td>
<td>13.2</td>
</tr>
<tr>
<td>Not interested in the subject</td>
<td>8</td>
<td>11.8</td>
</tr>
<tr>
<td>I need it for the course I want to do</td>
<td>5</td>
<td>7.4</td>
</tr>
<tr>
<td>I had already decided what subjects to take</td>
<td>5</td>
<td>7.4</td>
</tr>
<tr>
<td>There is too much to catch up on, having not taken Science at Junior Certificate</td>
<td>3</td>
<td>4.4</td>
</tr>
<tr>
<td>Science is boring</td>
<td>3</td>
<td>4.4</td>
</tr>
<tr>
<td>I chose Biology because it was the best option on the timetable slot</td>
<td>3</td>
<td>4.4</td>
</tr>
<tr>
<td>We haven't done much</td>
<td>2</td>
<td>2.9</td>
</tr>
<tr>
<td>Biology is interesting</td>
<td>2</td>
<td>2.9</td>
</tr>
<tr>
<td>Too difficult</td>
<td>2</td>
<td>2.9</td>
</tr>
<tr>
<td>Science is a lot of work and it is very confusing at Leaving Certificate level</td>
<td>1</td>
<td>1.5</td>
</tr>
<tr>
<td>I do not need it for the course I want to do</td>
<td>1</td>
<td>1.5</td>
</tr>
<tr>
<td>Transition Year Science is bad</td>
<td>1</td>
<td>1.5</td>
</tr>
</tbody>
</table>

Transition Year did not encourage some pupils to take a Science subject for their Leaving Certificate, and the reasons behind this were that many pupils had their mind made up prior to the year, and always planned to take a Science subject at Leaving Certificate level (45.6%). Other pupils noted a lack of interest in the sciences, and that they need to take a Science subject, not because the Transition Year had encouraged them, but because they needed it for the course they were planning to take at third level.
7.8 Summary of section

This section of chapter 7 has presented the results from the pupils’ questionnaires. The main findings were that Science is not ranked among Transition Year pupils top five favourite subjects, but pupils rank Science higher in terms of their achievement in it, and it is among pupil’s top four subjects in this category. Science does feature in Junior Certificate pupils’ top five subjects. Pupils at both Junior Certificate and Transition Year display typical gender differences in the interest levels they have for the different Science subjects, with male pupils displaying more interest in Physics and female pupils displaying more interest in Biology. Transition Year pupils are more negative about Junior Certificate Science than Junior Certificate pupils, in terms of the subject giving them a sense of what careers in Science are available, the work of a scientist, and the third level courses available in the area. Pupils believe that Transition Year Science is more interesting and more fun than Junior Certificate Science. There is also more practical work in Transition Year Science classes. However, both Transition Year and Junior Certificate pupils rate their enjoyment of their Science class highly, giving it a 2 on a five point Likert scale, where 1 is the top score and 5 is the lowest score. There are significant differences in the type of activities that pupils experience in their Science classes. Transition Year Science classes do involve more group, practical and activities, whereas Junior Certificate pupils display a heavier reliance on textbooks, do more calculations, and experience more assessment. The is more and better subject and careers information and guidance given to Transition Year pupils, particularly in terms of careers in Science. Transition Year pupils find their career-guidance sessions more useful than Junior Certificate pupils. Transition Year pupils have a higher than national average planned uptake of Science subjects, but there is a dominance of Biology. When the pupils’ reasons for taking a Science subject at senior cycle were compared Transition Year pupils were more negative and less likely to take a Physical Science subject than the Junior Certificate pupils. Overall the Transition Year encouraged half the pupils to take a Science subject at senior cycle. This effect was more significant for female pupils, and if pupils had indicated that they enjoyed their Science class. These results will be discussed in more detail, in the context of the whole study and the research questions, in chapter
7.9 Introduction to third level student questionnaires results

This portion of the chapter will present the results from the third level student questionnaire. This questionnaire was designed to examine why students chose to take a third level Science based degree and how, if at all the Transition Year had influenced them on this path. It was also designed to take a retrospective look back at these students’ experiences of Science in the Transition Year and school.

7.10 Student profile and Demographics

All students taking a first year General Chemistry module in the University of Limerick were asked to take part in this study. The questionnaire was designed to take a retrospective look at students’ experiences of Science at Second level, in particular, their experiences of Science in the Transition Year. The author wanted to investigate how these experiences may have influenced their decision to study Science- or Engineering-based courses at University. The enrolment in the general Chemistry module consisted of 400 students and there was a response rate of 88.8% (N = 355). The questionnaire was administered to students during their laboratory practical sessions, in order to maximise the response rate. The sample profile of those who responded is outlined here.

The response rate of this study indicates that the ratio of males to females is as expected for a group of third level students studying Science and Engineering based courses. Male students are in the majority making up 62.0% (n = 220) of the sample and females making up 36.3% (n = 129). The remaining 0.7% of students (n = 6) chose not to respond to the question asking them to indicate their gender.

However, this male dominated trend is not true for all Science and Engineering based degree programmes. Students were studying 16 different courses, including some ‘study abroad’ students, which were categorised into three different fields; Science (72%), Engineering (19%) and Education (9%). Education included concurrent teacher training degree programmes in the Biological Sciences with Chemistry or Physics, the Physical Sciences, and Physical education with a minor in Chemistry and Technology.
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Figure 7.18: Breakdown of the students by gender and course area.

For students of Science the picture is much the same as the overall one. The gender imbalance towards the males is also seen for the Engineering students, though to a much greater extent, with 94% comprising of male students (n = 31) and only 6% of female students (n = 2). In the Education course students are predominantly female (65%, n = 42), with 35% of male students (n = 23). A possible reason for the high proportion of female students in the education course, even though the education course is a Science based degree, is that the first destination of graduates is usually teaching and this is now a predominantly female profession (O’Connor 2007).

The cohort of students in this sample is not representative nationally, in terms of the education students this may be explained by the fact that the national figures relate to all students in education, whereas the education students in this cohort are studying Science and technology, two areas which are usually more male dominated.

Figure 7.20 below indicates the range of ages of the sample, ranging from 17 years to 51 years of age. The median age of the sample is 18, (50th percentile) with 90% of the sample under the age of 24. This is as expected for a group of first year students, with the much older cohort being made up of mature students, who have decided to
return to education. The median is used in this instance as the measure of centrality, due to the outliers in this case distorting the mean.

It is worth noting that the number of full-time enrolments in general is increasing across the age spectrum. The number of mature students (23+) entering higher education increased by 8.8% between 2007/08 and 2008/09. Currently mature students account for 13% of the national student body. (Higher Education Authority 2010)

Students came from a range of different schooling backgrounds, as can be seen in Figure 7.21 below, with the majority of students being supplied from secondary schools (n = 226).

Figure 7.19: Breakdown of the student sample by age (n = 350).
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Figure 7.20: Breakdown of students by school type (n = 346).

These percentages indicating school type are not representative of the Irish student population as a whole, in Ireland 54% of students attend secondary schools, 30% of students attend vocational schools and 16% attend community and comprehensive schools. Reasons for the difference in this sample may be that the provision of Science in post-primary schools in Ireland is not as universal as one might hope, as previously mentioned in Chapter 2. The type of school involved plays an important role, with vocational schools being less likely to provide the physical sciences, and the highest provision of the physical sciences being in secondary and community and comprehensive schools (Smyth and Hannan 2002). This may explain why such a low number of students taking Science or Engineering based courses come from vocational schools as they have a serious lack of provision in the physical sciences and the lowest level of provision in the biological sciences (Smyth and Hannan 2002).
Single-sex female schools accounted for 15.0% (n = 53) of the schools shown in Figure 7.22, single-sex male schools accounted for 22.5% (n = 80) of schools and the majority of schools were co-educational, (66.7%, n = 219). Once again this is not representative of the national enrolments in second level schools. Single-sex male schools comprise of 14.7% of all second level schools in Ireland, single sex-female schools make up 19.3% and the remaining 66.0% are co-educational schools. While co-educational schools are well represented, single-sex male schools are over represented in this sample and single-sex female schools are underrepresented. A possible reason for this may be that there is a lower provision of Science in single-sex female schools, with fewer of these schools requiring Science to be taken as a compulsory subject at any stage of pupils’ second level education (Smyth and Hannan 2002).
7.11 Student Background in Science

7.11.1 What Science subjects are taken?

Table 7.21, clearly indicates that nearly all students took Mathematics for the Leaving Certificate (96.0%, n = 339). The vast majority (99.9%) of Irish students take Mathematics until the end of their second level education, unlike most European countries, this one of the strengths of the Irish education system (Childs 2010c). The results in the table below show a far greater percentage of students taking Mathematics at higher level than the national average. Current trends show 16% of students took higher level Mathematics in the 2010 Leaving Certificate, illustrating that this cohort is well above average in their uptake of higher level Mathematics (Childs 2010a). One possible cause for this considerable difference is that Engineering students need higher level Mathematics as it is a course entry requirement, and this may have led to a higher than average number of students having higher level Mathematics. However, it is also important to recognise that the Engineering students only make up 9.30% of the cohort and even when excluding these students the numbers taking higher level Mathematics are well above average (39.5%). Kruskal Wallis testing indicated that this links to students’ belief that Mathematics understanding is important when taking a third level Science or Engineering based degree programme, though this was not shown to be a significant link (p = 0.055).

Biology is the most popular Science subject, followed by Chemistry and then Physics. Agricultural Science is marginally behind Physics in terms of popularity, whereas Physics & Chemistry was only taken by 7 students and is the least popular Science subject. When examining what subjects were taken by students it is important to keep subject provision within schools in mind. Physics & Chemistry has the lowest provision in second level schools, followed by Agricultural Science and Physics.
Table 7.21: Mathematics and Science subjects taken for Leaving Certificate by gender

<table>
<thead>
<tr>
<th>Subject</th>
<th>Male (n = 220)</th>
<th>Female (n = 129)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number of pupils (%)</td>
<td>Number of pupils (%)</td>
</tr>
<tr>
<td>Mathematics</td>
<td>210 (95.5%)</td>
<td>123 (95.4%)</td>
</tr>
<tr>
<td>Physics</td>
<td>84 (38.2%)</td>
<td>20 (15.5%)</td>
</tr>
<tr>
<td>Chemistry</td>
<td>66 (30.0%)</td>
<td>62 (48.1%)</td>
</tr>
<tr>
<td>Biology</td>
<td>86 (39.1%)</td>
<td>114 (88.4%)</td>
</tr>
<tr>
<td>Agricultural Science</td>
<td>46 (20.9%)</td>
<td>28 (21.7%)</td>
</tr>
<tr>
<td>Physics &amp; Chemistry</td>
<td>5 (2.27%)</td>
<td>2 (1.55%)</td>
</tr>
</tbody>
</table>

Table 7.21 indicates a disparity between the number of male and female students taking Science subjects at Leaving Certificate level. While the numbers taking Mathematics remains similar for both genders, the percentage of males taking Physics is more than double that of the females. On the opposite end of the scale over double the percentage of female, compared to male students, has taken Biology at Leaving Certificate. A higher proportion of females also opted for Chemistry, with 18% more female than male students having taken Chemistry at Leaving Certificate. When examining whether students took the various Science subjects in combination it was noted that Science subjects were quite frequently taken on their own, but some students took combinations of subjects. A number of students took two Science subjects, Biology and Chemistry was taken by 24.4% (n = 85) students at all levels. This was the most popular subject combination. Biology and Agricultural Science was the second most popular subject combination with 13.8% (n = 48) of students taking these subjects together, 12.0% (n = 42) students took a combination of Physics and Chemistry, and 9.17% (n = 32) of students took both Biology and Physics, but only 4.58% (n = 16) of students took the three main Science subjects, Physics, Chemistry and Biology. A clearer picture of the subject combinations is illustrated in Figure 7.23 below.
This section examines the different levels that students took subjects at for their Leaving Certificate. While Mathematics had a relatively even divide between higher and ordinary level, the majority of students taking the sciences took them at higher level, as can be seen in Table 7.22 below.
Table 7.22: Level of Mathematics and Sciences taken at Leaving Certificate Level.

<table>
<thead>
<tr>
<th>Subject</th>
<th>n total</th>
<th>% total</th>
<th>Higher Level, N</th>
<th>Higher Level, %</th>
<th>Ordinary Level, n</th>
<th>Ordinary Level, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mathematics</td>
<td>339</td>
<td>96%</td>
<td>154</td>
<td>43%</td>
<td>185</td>
<td>52%</td>
</tr>
<tr>
<td>Physics</td>
<td>105</td>
<td>30%</td>
<td>97</td>
<td>92%</td>
<td>8</td>
<td>8%</td>
</tr>
<tr>
<td>Chemistry</td>
<td>129</td>
<td>36%</td>
<td>123</td>
<td>95%</td>
<td>6</td>
<td>5%</td>
</tr>
<tr>
<td>Agricultural Science</td>
<td>203</td>
<td>57%</td>
<td>196</td>
<td>97%</td>
<td>7</td>
<td>4%</td>
</tr>
<tr>
<td>Physics &amp; Chemistry</td>
<td>7</td>
<td>2%</td>
<td>7</td>
<td>100%</td>
<td>0</td>
<td>0%</td>
</tr>
</tbody>
</table>

When gender is taken into account, the picture does not change drastically from that of the whole cohort, as shown in Table 7.23.
Table 7.23: Breakdown of students’ Leaving Certificate subjects by level taken and student gender.

| Male (n = 220) | Level    | Mathematics | n   | %   | Physics | n   | %   | Chemistry | n   | %   | Biology | n   | %   | Agricultural Science | n   | %   | Physics & Chemistry | n   | %   |
|               |          |             |     |     |         |     |     |           |     |     |         |     |     |                         |     |     |                         |     |     |
|               | Higher Level |          | 103 | 49.0 | 78     | 92.9| 62  | 93.9      | 84  | 97.7| 45     | 97.8| 5   | 100                     |     |     |                         |     |     |
|               | Ordinary Level |      | 107 | 50.9 | 6      | 7.14| 4   | 6.06      | 2   | 2.33| 1      | 2.17| 0   | 0                       |     |     |                         |     |     |
|               | Higher Level |          | 50  | 40.7 | 18     | 90.0| 60  | 96.8      | 109 | 95.6| 27     | 96.4| 2   | 100                     |     |     |                         |     |     |
|               | Ordinary Level |      | 73  | 59.3 | 2      | 10.0| 2   | 3.23      | 5   | 4.39| 1      | 3.57| 0   | 0                       |     |     |                         |     |     |
Mathematics has a higher percentage of male students taking it at higher level; this is also true for Physics, though only slightly. However, in Chemistry this is reversed and it is clearly seen that a slightly higher percentage of females are taking this subject at higher level. These findings are not significant for any of the subjects.

7.11.2 Student CAO Points in Science

In this section the Central Applications Office points achieved by the students in each course area will be discussed. The points allocated per grade are based on the bands as directed by the Central Applications Office (CAO), see Table 7.24 below.

<table>
<thead>
<tr>
<th>Table 7.24: Points for Leaving Certificate Grades</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grade</td>
</tr>
<tr>
<td>-------</td>
</tr>
<tr>
<td>A1</td>
</tr>
<tr>
<td>A2</td>
</tr>
<tr>
<td>B1</td>
</tr>
<tr>
<td>B2</td>
</tr>
<tr>
<td>B3</td>
</tr>
<tr>
<td>C1</td>
</tr>
<tr>
<td>C2</td>
</tr>
<tr>
<td>C3</td>
</tr>
<tr>
<td>D1</td>
</tr>
<tr>
<td>D2</td>
</tr>
<tr>
<td>D3</td>
</tr>
</tbody>
</table>

It was decided to examine the effect of different variables on the number of CAO points achieved by students. In order to achieve this, the cohort was broken down into a number of smaller groups looking at variables such as course area, school type, and gender.

Table 7.25 below gives a clearer picture of the CAO point’s breakdown for each subject.
### Table 7.25: Breakdown of students’ CAO points in each Science subject

<table>
<thead>
<tr>
<th>Grade</th>
<th>Mathematics Level</th>
<th>Physics Level</th>
<th>Chemistry Level</th>
<th>Biology Level</th>
<th>Agricultural Science Level</th>
<th>Physics &amp; Chemistry Level</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean points</td>
<td>Mean points</td>
<td>Mean points</td>
<td>Mean points</td>
<td>Mean points</td>
<td>Mean points</td>
</tr>
<tr>
<td></td>
<td>H m pts = 72.3</td>
<td>O m pts = 43.2</td>
<td>H m pts = 76.0</td>
<td>H m pts = 82.9</td>
<td>H m pts = 82.5</td>
<td>H m pts = 51.7</td>
</tr>
<tr>
<td></td>
<td>N n = 31</td>
<td>N n = 10</td>
<td>N n = 17</td>
<td>N n = 27</td>
<td>O n = 12</td>
<td>O n = 1</td>
</tr>
<tr>
<td>A1</td>
<td>4</td>
<td>6</td>
<td>4</td>
<td>35</td>
<td>12</td>
<td>1</td>
</tr>
<tr>
<td>A2</td>
<td>7</td>
<td>11</td>
<td>1</td>
<td>41</td>
<td>10</td>
<td>0</td>
</tr>
<tr>
<td>B1</td>
<td>9</td>
<td>13</td>
<td>25</td>
<td>25</td>
<td>13</td>
<td>3</td>
</tr>
<tr>
<td>B2</td>
<td>42</td>
<td>19</td>
<td>17</td>
<td>29</td>
<td>15</td>
<td>1</td>
</tr>
<tr>
<td>B3</td>
<td>14</td>
<td>8</td>
<td>16</td>
<td>27</td>
<td>9</td>
<td>1</td>
</tr>
<tr>
<td>C1</td>
<td>26</td>
<td>12</td>
<td>14</td>
<td>14</td>
<td>8</td>
<td>0</td>
</tr>
<tr>
<td>C2</td>
<td>17</td>
<td>7</td>
<td>13</td>
<td>11</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>C3</td>
<td>13</td>
<td>4</td>
<td>6</td>
<td>5</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>D1</td>
<td>12</td>
<td>4</td>
<td>4</td>
<td>2</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>D2</td>
<td>5</td>
<td>6</td>
<td>4</td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>D3</td>
<td>2</td>
<td>1</td>
<td>3</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The mean number of points achieved by the whole cohort of first year students, who chose a Science-based course at third level, was: for Mathematics 56.5 points, Biology was much stronger, with a mean of 81.1 points; students who studied Agricultural Science for their Leaving Certificate also did well with a mean of 80.5 points. Students who studied the Physical Sciences scored, on average 10 points lower in these subjects, in comparison with the biological Science subjects such as Biology and Agricultural Science. However, this could be explained by the stronger mathematical component involved in the physical sciences subjects, though studies have shown that students’ perception that examinations of the physical Science subjects are more difficult and undergo more rigorous marking than other subjects. (Politis et al. 2007) Further studies have shown that this perception is not wholly unfounded (Department of Education and Science 2002). Physics students’ mean score of CAO points was 73.7, and Chemistry students’ mean score was 73.4. However, the weakest score was seen in the subject of Physics & Chemistry: a mean of 51.7 was scored by students who took this subject.

The differences between students’ gender on their CAO points was also of interest, and the findings are illustrated in Table 7.26. While there are differences in CAO points between male and female pupils for all subjects, Chi-square tests showed that none of these were significant (p > 0.05).
Table 7.26: CAO points achieved in Mathematics and Science subjects by gender

<table>
<thead>
<tr>
<th>Subject</th>
<th>Male</th>
<th>Female</th>
<th>Difference (males vs. females)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mathematics</td>
<td>57.7</td>
<td>54.7</td>
<td>+ 3.0</td>
</tr>
<tr>
<td>Physics</td>
<td>73.3</td>
<td>75.0</td>
<td>- 1.7</td>
</tr>
<tr>
<td>Chemistry</td>
<td>72.0</td>
<td>74.7</td>
<td>- 2.7</td>
</tr>
<tr>
<td>Biology</td>
<td>81.9</td>
<td>80.5</td>
<td>+1.4</td>
</tr>
<tr>
<td>Agricultural Science</td>
<td>80.1</td>
<td>83.0</td>
<td>-2.9</td>
</tr>
<tr>
<td>Physics &amp; Chemistry</td>
<td>Cannot be computed due to insufficient numbers</td>
<td>Cannot be computed due to insufficient numbers</td>
<td>Cannot be computed due to insufficient numbers</td>
</tr>
</tbody>
</table>

Table 7.26 illustrates that male students performed better than female students in Mathematics and Biology, but the female students excelled ahead of the males in Physics, Chemistry and Agricultural Science, although differences are not significant.

7.12 Student Reasons for taking Science

7.12.1 Influences on students deciding to take a Science or Engineering course

Students were asked to indicate the main person influencing them in their choice of third level course. Table 7.27 clearly indicates that the strongest influence on students’ decision to take a Science based third level course is parental. The decision to use the median as the measure of centrality rather than the mean is due to the outliers and non-normal distribution of the data in all groups. Mann Whitney tests were performed to compare the data.
The strongest influences on students’ decision to take a Science-based course at third level is parental with 48.2% (n = 171) of students responding that their parents had been a very strong (n = 57) and strong (n = 114) influence. The second largest influence on students’ decision was their teacher: 44.2% (n = 157) of students indicating that their teacher was either a strong (n = 86) or a very strong (n = 71) influence.

The least influential person in the students’ decision to take a Science based course at third level was the school principal with 59.1% (n = 210) of students indicating that their schools principal’s influence was weak (n = 91) or very weak (n = 119). Siblings were also not considered to have a strong influence, with 39.4% of students noting that their siblings influence was weak (n = 63) or very weak (n = 77). The influence of the school career guidance teacher on the students was not considered particularly strong. 34.9% of students noted that the influence of their career guidance teacher was either weak (n = 50) or very weak (n = 74). The influence of students’ friends on their decision to take a Science- or an Engineering-based course at third level was also tending towards weak (n = 71) or very weak (n = 49), with 33.8% of students choosing these options.

Questions exploring parents’ background, socio-economic status and level of education were not included in this questionnaire due to ethical issues. However, it was decided to include a question exploring whether parents worked in a Science-
based industry, in order to examine whether this would influence students to take Science. Most students do not have parents working in a Science-based industry. Only 7.0% of students (n = 24) had their mother working in a Science based industry and a similarly low number, 10.0% (n = 36) had their father working in a Science based industry. 3.0% (n = 11) of the sample had both of their parents working in a Science based industry, while the majority (n = 281, 80%) said that neither of their parents worked in a Science based industry. There is currently very little data on the percentage of the population working in Science-based industry to indicate whether this is different from the norm. However, when examining the key influencers on students deciding whether to take a Science- or Engineering-based degree, parents are more influential for students who have a parent or both parents working in a Science based industry, as Figure 7.24 below indicates. The Kruskal Wallis test was performed and responses did not show this to be statistically significant (H (3) = 5.40, p > 0.05).

Figure 7.23: The influence of parents versus parents working in a Science based industry
Table 7.28: Influences on students decision to take a Science based third level course by gender, course area and whether the Transition Year was taken.

<table>
<thead>
<tr>
<th>Influence</th>
<th>Gender P-values</th>
<th>Course Area p – values</th>
<th>Transition Year p - values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parents</td>
<td>0.541</td>
<td>0.014*</td>
<td>0.522</td>
</tr>
<tr>
<td>Teacher</td>
<td>0.048*</td>
<td>0.000***</td>
<td>0.926</td>
</tr>
<tr>
<td>Friends</td>
<td>0.258</td>
<td>0.381</td>
<td>0.167</td>
</tr>
<tr>
<td>Siblings</td>
<td>0.087</td>
<td>0.122</td>
<td>0.570</td>
</tr>
<tr>
<td>Career – Guidance Teacher</td>
<td>0.043*</td>
<td>0.982</td>
<td>0.853</td>
</tr>
<tr>
<td>School Principal</td>
<td>0.401</td>
<td>0.388</td>
<td>0.022*</td>
</tr>
</tbody>
</table>

Significance levels: * p < 0.05, ** p <0.01, *** p <0.001

The various influential factors for the students were all examined using the Mann-Whitney test for gender and the Transition Year, and the Kruskal-Wallis test for course area, due to the non-parametric nature of the data. It was found that the only significant influence for female students was their teacher. However, career-guidance teachers were more of a significant influence for male students. Parents were a significant influence for students in the course area of Science, but this was not true for education and Engineering students. Interestingly, the teacher was a strong and significant influence for students in the course area of education. No significant influences were found for students who took the Transition Year. However, for those students who did not take the Transition Year the school principal was found to be influential.

7.12.2 Students’ views on the importance of Science and Mathematics

Students were asked to rate the importance of taking a Science subject for the Leaving Certificate, on a 5 point Likert scale, ranging from very important to unimportant. The student values closest to 1 are the numbers of most importance,
while values at the end of the scale (5), indicate that the students did not consider taking Science for the Leaving Certificate to be important.

Table 7.29: Summary of students’ beliefs on the importance of taking Science for the Leaving Certificate.

<table>
<thead>
<tr>
<th>Importance of taking Science for the Leaving Certificate</th>
<th>Mean value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student grouping</td>
<td></td>
</tr>
<tr>
<td>Course area:</td>
<td></td>
</tr>
<tr>
<td>Science students</td>
<td>1.53</td>
</tr>
<tr>
<td>Engineering</td>
<td>1.51</td>
</tr>
<tr>
<td>Education</td>
<td>1.34</td>
</tr>
<tr>
<td>Transition Year</td>
<td></td>
</tr>
<tr>
<td>Took the Transition Year</td>
<td>1.44</td>
</tr>
<tr>
<td>Did not take the Transition Year</td>
<td>1.53</td>
</tr>
<tr>
<td>Gender:</td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>1.6</td>
</tr>
<tr>
<td>Female</td>
<td>1.36</td>
</tr>
</tbody>
</table>

Mann-Whitney tests were conducted on the data, due to its non-parametric nature. The differences between these values were not significant for any group, except for gender (p = 0.010). Female students believed that having a Science subject for the Leaving Certificate was more important than male students. Overall, all students believed that taking Science for the Leaving Certificate was very important.

Students were also asked to rate the importance of Mathematics understanding, when doing a third level Science degree, on a 5 point Likert scale, ranging from very important to unimportant. Once again, the values closest to 1 indicate importance, while closer to 5 signify unimportant.
Table 7.30: Summary of students’ beliefs on the importance of Mathematics understanding when taking a third level Science course.

<table>
<thead>
<tr>
<th>Importance of Mathematics understanding, when doing a third level Science course</th>
<th>Student grouping</th>
<th>Mean value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Course area:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Science students</td>
<td>1.79</td>
<td></td>
</tr>
<tr>
<td>Engineering</td>
<td>1.56</td>
<td></td>
</tr>
<tr>
<td>Education</td>
<td>1.69</td>
<td></td>
</tr>
<tr>
<td>Transition Year</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Took the Transition Year</td>
<td>1.76</td>
<td></td>
</tr>
<tr>
<td>Did not take the Transition Year</td>
<td>1.84</td>
<td></td>
</tr>
<tr>
<td>Gender:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>1.71</td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>1.82</td>
<td></td>
</tr>
</tbody>
</table>

Mann-Whitney tests were also conducted on the data collected in the table above, no significant differences were found for any of the groups.

7.13 The Transition Year

7.13.1.1 Who took the Transition Year?

| Figure 7.31: Breakdown of the students who took the Transition Year by gender |
|-------------------------------|-----------------|-----------------|-----------|
|                               | Males           |                 | Females   |           |
|                               | n               | %               | n         | %         |
| Took the Transition Year      | 86              | 48.3            | 67        | 59.8      |
| Did not take the Transition Year | 92              | 51.7            | 45        | 40.2      |

When examining the gender breakdown of the Transition Year it can be seen that a slightly higher percentage of female students had taken the Transition Year. Chl-
square testing was conducted and this was not statistically significant (p = 0.056) and is in line with the trends found by Smyth et al. (2004).

All course areas taken by the students in this cohort seemed to be relatively comparable in terms of the numbers of students who had taken the Transition Year. A slightly higher proportion of Education students had taken the year, but this was not a significant finding.

Table 7.32: Breakdown of the students who took the Transition Year by course area.

<table>
<thead>
<tr>
<th></th>
<th>Science</th>
<th></th>
<th>Education</th>
<th></th>
<th>Engineering</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
<td>n</td>
<td>%</td>
<td>n</td>
<td>%</td>
</tr>
<tr>
<td>Took the</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transition Year</td>
<td>110</td>
<td>52.4</td>
<td>33</td>
<td>57.9</td>
<td>15</td>
<td>51.7</td>
</tr>
<tr>
<td>Did not</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>take the</td>
<td>100</td>
<td>47.6</td>
<td>24</td>
<td>42.1</td>
<td>14</td>
<td>48.3</td>
</tr>
<tr>
<td>Transition Year</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
7.13.2 Science subjects sampled in the Transition Year

The most commonly sampled subject was Biology, followed by Chemistry and Physics. Very few students sampled either Agricultural Science or Physics & Chemistry. Nearly a third of students (27.8%) appear not to have sampled any Science subjects during their Transition Year.
Figure 7.25: Science subject combinations for students who sampled more than one Science subject in the Transition Year (n =110).
The most noticeable result from Figure 7.26 is that over one third of students sampled only one Science subject during their Transition Year. Clearly the most popular subject combinations were Biology and Chemistry, Physics and Chemistry and Biology and Physics. Only half (51.3%) of the students who took the Transition Year sampled all three core Science subjects; Physics, Chemistry and Biology.

7.13.3 Frequency of Practical Work

Figure 7.26: The frequency of practical work in the Transition Year Science class (n = 144).

Practical work was completed by the majority of students (84.7%) at least once a week. However, very few students had a practical experience in every Transition Year Science class, and over half the cohort did not experience practical work in every double period. 15.3% of the students did not experience practical work in their Transition Year Science class at least once a week.
### Table 7.33: Activities experienced by students in their Transition Year Science classes

<table>
<thead>
<tr>
<th>Type of Activity</th>
<th>Often</th>
<th>Sometimes</th>
<th>Rarely</th>
<th>Never</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
<td>n</td>
<td>%</td>
</tr>
<tr>
<td>Write in your Science book n = 139</td>
<td>31</td>
<td>22.3%</td>
<td>38</td>
<td>27.3%</td>
</tr>
<tr>
<td>Listen to the teacher talk about topics n =141</td>
<td>92</td>
<td>65.2%</td>
<td>35</td>
<td>24.8%</td>
</tr>
<tr>
<td>Listen to the teacher give an explanation to the class n = 139</td>
<td>91</td>
<td>65.5%</td>
<td>30</td>
<td>21.6%</td>
</tr>
<tr>
<td>Read a Science text book</td>
<td>31</td>
<td>22.6%</td>
<td>32</td>
<td>23.4%</td>
</tr>
<tr>
<td>Have discussions about Science n = 141</td>
<td>46</td>
<td>32.6%</td>
<td>50</td>
<td>35.5%</td>
</tr>
<tr>
<td>Watch the teacher use apparatus/materials to demonstrate an idea n = 137</td>
<td>62</td>
<td>45.3%</td>
<td>45</td>
<td>32.8%</td>
</tr>
<tr>
<td>Do calculations n =140</td>
<td>41</td>
<td>29.3%</td>
<td>47</td>
<td>33.6%</td>
</tr>
<tr>
<td>Carry out experiments n = 139</td>
<td>66</td>
<td>47.5%</td>
<td>47</td>
<td>33.8%</td>
</tr>
<tr>
<td>Do project work n = 140</td>
<td>46</td>
<td>32.9%</td>
<td>39</td>
<td>27.9%</td>
</tr>
<tr>
<td>Take part in group work n = 137</td>
<td>65</td>
<td>47.4%</td>
<td>49</td>
<td>35.8%</td>
</tr>
<tr>
<td>Give a presentation to the class or watch your peers present to the class n = 137</td>
<td>20</td>
<td>14.6%</td>
<td>21</td>
<td>15.3%</td>
</tr>
<tr>
<td>Debates n = 136</td>
<td>12</td>
<td>8.8%</td>
<td>20</td>
<td>14.7%</td>
</tr>
<tr>
<td>Watch T.V., DVDs, or videos on scientific topics n =137</td>
<td>36</td>
<td>26.3%</td>
<td>53</td>
<td>38.7%</td>
</tr>
<tr>
<td>Go on field trips e.g. visit to industry/companies/museums n = 136</td>
<td>17</td>
<td>12.5%</td>
<td>30</td>
<td>22.1%</td>
</tr>
<tr>
<td>Listen to visiting speakers n = 137</td>
<td>8</td>
<td>5.8%</td>
<td>27</td>
<td>19.7%</td>
</tr>
<tr>
<td>Have written assessments n =137</td>
<td>25</td>
<td>18.2%</td>
<td>27</td>
<td>19.7%</td>
</tr>
<tr>
<td>Have Oral assessments n = 136</td>
<td>15</td>
<td>11.0%</td>
<td>36</td>
<td>26.5%</td>
</tr>
<tr>
<td>Have an assessment on your practical/experimental work n = 135</td>
<td>22</td>
<td>16.3%</td>
<td>51</td>
<td>37.8%</td>
</tr>
<tr>
<td>Attend talks/lectures n = 132</td>
<td>18</td>
<td>13.6%</td>
<td>32</td>
<td>24.2%</td>
</tr>
<tr>
<td>Use a computer n =</td>
<td>44</td>
<td>33.3%</td>
<td>35</td>
<td>26.5%</td>
</tr>
<tr>
<td>Activities such as SciFest, BT Young Scientist, Science Fairs etc. n = 132</td>
<td>24</td>
<td>18.2%</td>
<td>26</td>
<td>19.7%</td>
</tr>
</tbody>
</table>

Traditional activities such as listening to the teacher talk about topics, listening to the teacher give an explanation to the class, having discussions about Science, doing...
calculations; experiments and watching the teacher demonstrate experiments were all common teaching and learning activities in the Transition Year Science classroom. However, the less common, ‘non-traditional’ teaching and learning methodologies were not utilised as frequently. Students rarely or never gave a presentation to the class on an area of Science, they did not partake in debates, watch educational videos or DVD’s, go on field trips to see industry or museums or to attend talks or lectures, or listen to visiting speakers. Students also rarely or never got involved in activities such as the B.T. Young Scientist Exhibition, SciFest or Science fairs. Formative assessment also appears to have been used infrequently, with students having rarely or never experienced oral or written assessment. Assessment on practical work was rarely or never experienced by 42.5% of students.

7.13.4 The Effect of the Transition Year on Science Subject Choice

Table 7.33, illustrates the differences in subject up-take by students, depending on whether or not they took the Transition Year. There is very little difference between the subjects taken by the students who took the Transition Year and those who did not take the year. Slightly more of the cohort who didn’t take the Transition Year took Chemistry. However students who took the Transition Year appeared more inclined to take Biology, with nearly 8% more taking the subject, when compared to those who did not take the Transition Year. Slightly more students who had taken the Transition Year also took Agricultural Sciences (3%).
Table 7.34: Subject up-take for Leaving Certificate by whether the Transition Year was taken

<table>
<thead>
<tr>
<th>Subject</th>
<th>Took the Transition Year</th>
<th>Did not take the Transition Year</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
</tr>
<tr>
<td>Mathematics</td>
<td>157</td>
<td>99.4%</td>
</tr>
<tr>
<td>Physics</td>
<td>48</td>
<td>30.4%</td>
</tr>
<tr>
<td>Chemistry</td>
<td>58</td>
<td>36.7%</td>
</tr>
<tr>
<td>Biology</td>
<td>104</td>
<td>65.8%</td>
</tr>
<tr>
<td>Agricultural Science</td>
<td>37</td>
<td>23.4%</td>
</tr>
<tr>
<td>Physics &amp; Chemistry</td>
<td>2</td>
<td>1.27%</td>
</tr>
</tbody>
</table>

Having examined these results, it can be concluded that taking the Transition Year does not appear to have a real effect on this cohort of students taking Science or Mathematics subjects for the Leaving Certificate. The same can also be said for the reasons why the students chose these subjects. Tables 7.34 and 7.35 show that the Transition Year has not played a significant role in the students’ reasoning for taking the various Science subjects for their Leaving Certificate.
### Table 7.35: Reasons for taking a Science subject at Leaving Certificate level for students who completed the Transition Year Programme.

<table>
<thead>
<tr>
<th>Reason</th>
<th>Physics (n = 48) %</th>
<th>Chemistry (n = 58) %</th>
<th>Biology (n 104) %</th>
<th>Agricultural Science (n = 37) %</th>
<th>Physics &amp; Chemistry (n = 2) %</th>
</tr>
</thead>
<tbody>
<tr>
<td>You were interested in the subject</td>
<td>77.1</td>
<td>81.0</td>
<td>86.5</td>
<td>75.7</td>
<td>50.0</td>
</tr>
<tr>
<td>You enjoy the subject</td>
<td>47.9</td>
<td>51.7</td>
<td>76.9</td>
<td>59.5</td>
<td>100.0</td>
</tr>
<tr>
<td>It was a requirement for the college course you wanted to do</td>
<td>25.0</td>
<td>39.7</td>
<td>48.1</td>
<td>2.2</td>
<td>0</td>
</tr>
<tr>
<td>You needed it for your future career</td>
<td>41.7</td>
<td>50.0</td>
<td>47.1</td>
<td>9.6</td>
<td>50.0</td>
</tr>
<tr>
<td>You felt it would be easy to get points in</td>
<td>10.4</td>
<td>8.6</td>
<td>31.7</td>
<td>64.9</td>
<td>50.0%</td>
</tr>
<tr>
<td>You had a good teacher</td>
<td>39.6</td>
<td>43.1</td>
<td>49.0</td>
<td>40.5</td>
<td>100.0</td>
</tr>
<tr>
<td>The relevance of the subject to everyday life</td>
<td>37.5</td>
<td>22.4</td>
<td>52.9</td>
<td>32.4</td>
<td>0</td>
</tr>
</tbody>
</table>
Table 7.36: Reasons for taking a Science subject at Leaving Certificate level for students who did not complete the Transition Year Programme.

<table>
<thead>
<tr>
<th>Reason</th>
<th>Physics (n = 41) %</th>
<th>Chemistry (n = 54) %</th>
<th>Biology (n= 80) %</th>
<th>Agricultural Science (n= 28) %</th>
<th>Physics &amp; Chemistry (n = 3) %</th>
</tr>
</thead>
<tbody>
<tr>
<td>You were interested in the subject</td>
<td>73.2</td>
<td>83.3</td>
<td>85.0</td>
<td>75.0</td>
<td>0</td>
</tr>
<tr>
<td>You enjoy the subject</td>
<td>43.9</td>
<td>57.4</td>
<td>66.3</td>
<td>60.7</td>
<td>33.3</td>
</tr>
<tr>
<td>It was a requirement for the college</td>
<td>26.8</td>
<td>42.6</td>
<td>45.0</td>
<td>14.3</td>
<td>0</td>
</tr>
<tr>
<td>course you wanted to do</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>You needed it for your future career</td>
<td>34.1</td>
<td>48.2</td>
<td>37.5</td>
<td>21.4</td>
<td>66.7</td>
</tr>
<tr>
<td>You felt it would be easy to get</td>
<td>14.6</td>
<td>11.1</td>
<td>28.8</td>
<td>53.6</td>
<td>0</td>
</tr>
<tr>
<td>points in</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>You had a good teacher</td>
<td>31.7</td>
<td>48.2</td>
<td>52.5</td>
<td>53.6</td>
<td>33.3</td>
</tr>
<tr>
<td>The relevance of the subject to daily</td>
<td>17.0</td>
<td>33.8</td>
<td>43.8</td>
<td>32.1</td>
<td>0</td>
</tr>
<tr>
<td>life</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
It is worth noting that the main reasons, for all students, when they take the various Science subjects is due to their interest in and their liking of the subject, though this is less so for the Physical Sciences. Few students took a Science subject because they believed it would be easy to achieve CAO points in it, with the exception of the students who took Agricultural Science.

Figure 7.28 below illustrates how important the students felt the Transition Year was in influencing them in their uptake of Leaving Certificate subjects.

![Histogram showing the importance of the Transition Year Programme in influencing the uptake of subjects at the Leaving Certificate level.](image)

**Figure 7.27: Importance of the Transition Year Programme in influencing the uptake of subjects at the Leaving Certificate level.**

The year was very important for some students (16.4%), but it was not considered to be significantly so for any group. 46.5% of students felt the year was either very important or important in their subject choice for Leaving Certificate. The year was slightly more important for female students (M = 2.66), than male students (M = 2.95), t-tests confirmed that this difference was not significant (p> 0.05).

Figure 7.29, indicates that the Transition Year was not an important factor when students were deciding what course to take at third level.
For those students who chose to take the Transition Year, the year was neither important nor unimportant in influencing their take-up of a Science or Engineering based course at third level. 42.5% of students felt the year was of little importance ($n = 35$) or unimportant ($n = 32$) influence on their decision to take a Science or Engineering based course at third level.

### 7.13.5 The effect of the Transition Year on Subject level in Science

As the one of the main foci of this study has been to investigate the effects of the Transition Year on the uptake of Science subjects at both second and third level, it was decided to examine the effect of the Transition Year on the level Leaving Certificate Science and Mathematics subjects were taken at. This is illustrated in Tables 7.36 and 7.37 below.
Table 7.37: Breakdown of Leaving Certificate Mathematics and Science subjects taken by students who did not take the Transition Year.

<table>
<thead>
<tr>
<th>Subject</th>
<th>n total</th>
<th>n, %</th>
<th>Higher Level, n</th>
<th>Higher Level, %</th>
<th>Ordinary Level, n</th>
<th>Ordinary Level, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mathematics</td>
<td>157</td>
<td>99%</td>
<td>71</td>
<td>45%</td>
<td>86</td>
<td>55%</td>
</tr>
<tr>
<td>Physics</td>
<td>48</td>
<td>30%</td>
<td>46</td>
<td>96%</td>
<td>2</td>
<td>4%</td>
</tr>
<tr>
<td>Chemistry</td>
<td>58</td>
<td>37%</td>
<td>56</td>
<td>97%</td>
<td>2</td>
<td>3%</td>
</tr>
<tr>
<td>Biology</td>
<td>104</td>
<td>66%</td>
<td>101</td>
<td>97%</td>
<td>3</td>
<td>3%</td>
</tr>
<tr>
<td>Agricultural Science</td>
<td>37</td>
<td>23%</td>
<td>35</td>
<td>95%</td>
<td>2</td>
<td>5%</td>
</tr>
<tr>
<td>Physics &amp; Chemistry</td>
<td>2</td>
<td>1%</td>
<td>2</td>
<td>100%</td>
<td>0</td>
<td>0%</td>
</tr>
</tbody>
</table>

Table 7.38: Breakdown of Leaving Certificate Mathematics and Science subjects taken by students who took the Transition Year.

<table>
<thead>
<tr>
<th>Subject</th>
<th>n total</th>
<th>n, %</th>
<th>Higher Level, n</th>
<th>Higher Level, %</th>
<th>Ordinary Level, n</th>
<th>Ordinary Level, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mathematics</td>
<td>134</td>
<td>97%</td>
<td>59</td>
<td>44%</td>
<td>75</td>
<td>56%</td>
</tr>
<tr>
<td>Physics</td>
<td>41</td>
<td>30%</td>
<td>37</td>
<td>90%</td>
<td>4</td>
<td>11%</td>
</tr>
<tr>
<td>Chemistry</td>
<td>54</td>
<td>39%</td>
<td>52</td>
<td>96%</td>
<td>2</td>
<td>4%</td>
</tr>
<tr>
<td>Biology</td>
<td>80</td>
<td>58%</td>
<td>78</td>
<td>98%</td>
<td>2</td>
<td>3%</td>
</tr>
<tr>
<td>Agricultural Science</td>
<td>28</td>
<td>20%</td>
<td>28</td>
<td>100%</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td>Physics &amp; Chemistry</td>
<td>3</td>
<td>2%</td>
<td>3</td>
<td>100%</td>
<td>0</td>
<td>0%</td>
</tr>
</tbody>
</table>
It has been shown that there is little difference between the two cohorts, and the Transition Year does not seem to have had much effect on the decision whether to take a subject at higher or ordinary level. It is worth noting that a slightly higher percentage of students (6%) who did not take the Transition Year chose to take Physics at higher level, in comparison to those students who took the Transition Year. The reverse is true for Agricultural Science, with slightly more students who took the Transition Year taking the subject at higher level (5%).

7.13.6 The effect of the Transition Year on C.A.O. points in Science

Studies have indicated that taking the Transition Year can increase students C.A.O. points (Millar and Kelly 1999, Smyth et al. 2004). Table 7.38 below clearly shows the effect of the Transition Year on C.A.O. points for Mathematics and Science subjects.
Table 7.39: Effect of the Transition Year on C.A.O. points for Mathematics and Science subjects

<table>
<thead>
<tr>
<th>Subject</th>
<th>Mean points (those who took the T.Y.)</th>
<th>Mean points (those who did not take the T.Y.)</th>
<th>Mean difference (points)</th>
<th>t</th>
<th>df</th>
<th>r (effect size)</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mathematics</td>
<td>57.99</td>
<td>55.59</td>
<td>2.50</td>
<td>1.149</td>
<td>282</td>
<td>-0.27</td>
<td>0.251</td>
</tr>
<tr>
<td>Physics</td>
<td>78.67</td>
<td>69.25</td>
<td>9.42</td>
<td>2.946</td>
<td>72.440</td>
<td>-0.14</td>
<td>0.150</td>
</tr>
<tr>
<td>Chemistry</td>
<td>76.20</td>
<td>71.5</td>
<td>4.69</td>
<td>1.449</td>
<td>105</td>
<td>0.27</td>
<td>0.004**</td>
</tr>
<tr>
<td>Biology</td>
<td>81.34</td>
<td>80.70</td>
<td>0.64</td>
<td>0.281</td>
<td>178</td>
<td>-0.021</td>
<td>0.779</td>
</tr>
<tr>
<td>Agricultural Science</td>
<td>78.78</td>
<td>85.35</td>
<td>-6.57</td>
<td>-2.257</td>
<td>63</td>
<td>-0.027</td>
<td>0.027*</td>
</tr>
<tr>
<td>Physics &amp; Chemistry</td>
<td>75.00</td>
<td>80.00</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

Significance levels: *p < 0.05, **p < 0.01, ***p<0.001

Students who took the Transition Year did do better and achieved higher CAO points in Mathematics and all Science subjects except Agricultural Science. These differences in points between the two groups were the most marked for students of Physics and Chemistry who took the Transition Year, with the difference not significant for Chemistry students, but with a small to medium effect size. This 5–10% increase is worth up to two grades in the CAO points system.
7.14 Career guidance

7.14.1 Type of career guidance offered

Figure 7.29: The types of career guidance offered to students in second level schools (n = 355).

Figure 7.30 indicates that the type of career guidance that was offered to students was varied, with over two thirds of students being offered aptitude tests and chats about their career options with the career-guidance counsellor. However, information about specific courses, careers and help with the decision of subject choice appears to be slightly more lacking. In particular, over 60% of students do not appear to be receiving help with guidance in their subject choices, something that may influence their future course in life.

Chi-square tests were conducted and Table 7.39 illustrates the significant differences in career-guidance received by students who took the Transition Year and those who did not take the year.
Table 7.40: Differences in career-guidance received by whether students took the Transition Year.

<table>
<thead>
<tr>
<th></th>
<th>Took the Transition Year (n = 158)</th>
<th>Did not take the Transition Year (n = 138)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Aptitude test</strong></td>
<td>116 (73.4%)</td>
<td>81 (58.7%)</td>
<td>0.007**</td>
</tr>
<tr>
<td><strong>Chat about career options</strong></td>
<td>112 (70.9%)</td>
<td>96 (70.1%)</td>
<td>0.879</td>
</tr>
<tr>
<td><strong>Information on specific careers</strong></td>
<td>80 (50.6%)</td>
<td>53 (38.7%)</td>
<td>0.040*</td>
</tr>
<tr>
<td><strong>Information on specific courses</strong></td>
<td>85 (53.8%)</td>
<td>59 (41.3%)</td>
<td>0.066</td>
</tr>
<tr>
<td><strong>Guidance on subject choice</strong></td>
<td>70 (44.6%)</td>
<td>53 (38.7%)</td>
<td>0.306</td>
</tr>
</tbody>
</table>
7.14.2 Student satisfaction with career guidance

Overall, the students were relatively neutral in their feelings of satisfaction towards the information provided by their career guidance teacher about Science and careers in the area. A high proportion of students were satisfied, however this was balanced out through the levels of dissatisfaction felt by other students. Independent t-tests were conducted in order to compare the students who had taken the Transition Year, with those students who had not taken the year. Overall, students’ who had taken the Transition Year were more satisfied (M = 2.8, SE = 0.11) than students who had not taken the year (M = 3.1, SE = 0.11, t(264) = -1.752, p = 0.081), though these differences were not significant.
CHAPTER 7: PUPIL RESULTS

Figure 7.31: Students’ perception of the quality of information that they received before choosing their third level degree programme.

The information received by the students before they decided to choose their college course appears, for the most part to have been quite good. A median = 2.00 was achieved on the scale, indicating that students were well informed about their course before they choose it. Median values were utilised, due to the non-parametric nature of the data. Mann Whitney testing was conducted, in order to compare the differences between students who had taken the Transition Year, and those who had not taken the year, but there were no significant differences (p>0.05).

7.14.3 Summary of section

The main findings of this section will be presented in this section, and discussed further in Chapter in the context of the research questions. The main influences on students’ decision on whether to take a third level Science-based course were parental and their teacher. Students whose parents worked in a Science-based industry found their parents to be more influential. The course area that pupils chose had a bearing on who their key influences were. Pupils in the area of Science found
their parents to be more influential than others. Teachers were significantly more influential for Education students.

Those who took the Transition Year believed that that Leaving Certificate Science was more important than those who did not take the year, and similarly those who took the Transition Year displayed a slightly stronger belief that Mathematics was important for a third level Science-based course. More female than male students had taken the Transition Year. Biology was the most common subject taken by students who had taken the Transition Year. There was a variety of teaching and learning activities experienced by students when they took the Transition Year, but these activities can be placed mainly in the realm of the traditional. The Transition Year was an important factor in pupils’ subject choice decisions for Leaving Certificate, more so for female students than for males. However, the year was unimportant in the decision whether to do a Science-based course at third level.

7.15 Conclusion

This chapter has presented results which examined the place of Science in the Transition Year from the pupils’ perspective, allowing a glimpse into the experiences pupils are having in the year.
CHAPTER 8: DISCUSSION
8.1 Introduction

This chapter seeks to explore the findings from all stages of the research and all sources of data and aims to assess the wider significance of these findings. These findings are discussed in the context of the original research questions, which in turn forms the basis for the conclusions presented in chapter 9. A thorough analysis and discussion of the results of this study, under the framework of the original research questions, allows for further triangulation of the data, while also providing a lens through which to focus the implications of these findings. This chapter seeks to take a step back from the detail provided by the results, and to discuss and draw practical and theoretical outcomes from the research.

The primary focus of this study has been to critically examine and evaluate the place of Science in the Irish Transition Year, taking the critical players (pupils, teachers and schools) into account. Therefore the initial research question was:

What is the place of Science in the Irish Transition Year?

Figure 8.1 illustrates how further research questions have stemmed from this initial one, based on the literature available.
CHAPTER 8: DISCUSSION

Figure 8.1: Research questions
Research Questions:

The three primary research questions were:

- What are the pupils’ experiences of Transition Year Science?
- What is the role of Science within Transition Year schools?
- How do science teachers utilise the Transition Year to teach Science?

In order to fully answer these research questions and focus the study, nine sub questions were formulated. These sub questions are:

- What are pupils’ attitudes towards Transition Year Science?
- What are pupils’ experiences of making subject choice decisions for Senior Cycle? Where do they get their information from and what type of information/advice do they receive?
- How do Transition Year pupils’ experiences of Science differ from Junior Certificate pupils’ experience of the subject?
- Why do pupils who choose to take science at Senior Cycle choose to do so? What impact, if any does taking Transition Year Science have on these decisions?
- What do Transition Year science teachers teach in their Transition Year Science classes? What is their rationale for teaching the content that they teach and how is it taught?
- Are there any factors that impact on how Science teachers teach Transition Year Science?
- Do schools display differences in how they provide Science both in the Transition Year, and subsequently at senior cycle?
- How is Transition Year Science treated and perceived within schools?
8.2 Pupils’ experiences of Transition Year Science

This component of the chapter aims to answer the research questions related to the pupils overall experiences of Science in the Transition Year. There are four research questions attributed to this section and each question will be dealt with separately and the key findings from each question will be summarised at the end of this section.

8.2.1 What are pupils’ attitudes towards Transition Year Science?

Results from the pupils surveyed in Phase 2 of this study are drawn upon in order to answer this research question (Chapter 7). Transition Year pupils did not rank Science among their top five favourite subjects, and although there were no significant differences between Junior Certificate pupils and Transition Year pupils in terms of the subjects that they ranked among their top five favourites, Science was fifth among Junior Certificate pupils’ favourite subjects. This suggests that the Transition Year may do nothing to halt the trend of pupils’ attitudes towards school Science becoming less positive as they get older, as indicated in much of the research examining attitudes towards Science (Monk and Osbourne 2000, Department of Education and Science 2002, Bennett 2003, Osborne et al. 2003, Kessels et al. 2006, Bennett and Hogarth 2009). Science was the fifth least favourite subject for both Junior Certificate and Transition Year pupils.

Pupils’ interest in the three main Science subjects was typical of the national and international trends (Osborne et al. 2003, OECD 2004, Schreiner and Sjoberg 2005, Matthews 2007, OECD 2007, Chang and Cheng 2008), with pupils favouring Biology as the Science subject in which they had the greatest interest; Chemistry was ranked in the middle, while Physics was ranked last. There were no differences in terms of interest in these three subjects between Junior Certificate and Transition Year pupils. The typical gender differences reported in the literature (Smyth and Hannan 2006, Politis et al. 2007) were displayed among all pupils, with female pupils exhibiting a greater interest in Biology and male pupils showing a greater interest in Physics. Chemistry was more gender neutral, though female pupils did display a greater interest in the subject. The differences in attitudes between the Transition Year cohort and the Junior Certificate cohort were noticeable, and
expressed in terms of the differences in their classroom experiences of the subjects. Transition Year pupils believed that Transition Year Science was more fun than Junior Certificate Science. The pupils (61.7%) also believed that it was more interesting than Junior Certificate Science. The pupils were almost equally divided regarding whether Transition Year Science involved more practical work than Junior Certificate Science, though this may reflect the variety of class time allocated to practical work amongst the various schools surveyed. Pupils displayed a variety of attitudes when describing the differences between Transition Year and Junior Certificate Science. Statements such as ‘It is less serious and more fun’ or ‘There is more practical work’ and ‘You are able to learn about what YOU are interested in instead of what you HAVE to’ allow for a greater insight into what the pupils feel are the greatest differences in Science between the two years. Pupils appeared to enjoy Science overall in both Junior Certificate and Transition Year, with no significant differences found between the two groups. However, the Transition Year pupils enjoyed their Science classes (55.1%) due to the ‘fun activities’, the fact that it was ‘interesting’ and ‘liking the practical work’. The body of research (Osborne et al. 2003, Kind et al. 2007, Barmby et al. 2008) in the area of attitudes towards Science suggests that pupils’ attitudes are composed of a variety of different constructs, that can be difficult to define, (Ormerod and Duckworth 1975, Barmby et al. 2008), but which are reflected in these findings.

The pupils express their attitudes towards both Transition Year and Junior Certificate Science in terms of descriptive statements about their enjoyment, interest, the classroom environment, the lack of pressure on them. These appear to be the key variances between the two groups’ attitudes towards Science, while both are positive, the experiences of the Transition Year pupils are perhaps more enjoyable, leading to a shift in attitudes. While Junior Certificate pupils are mainly content in their Science classes, the Transition Year pupils having experienced a different type of learning environment are more broadly positive, particularly when comparing their Transition Year Science classes to their Junior Certificate Science classes. That is not to say that the pupils had no negative attitudes or feelings towards their experiences. Pupils also expressed feelings regarding their lack of enjoyment of the subject in the year. These were primarily to do with disliking the Physical Science in the year, finding the subject boring and uninteresting, and feeling that ‘we don’t do much of anything’.
Again, the classroom experiences emerge as a crucial factor in shaping pupils' attitudes towards Transition Year Science. While pupils in the Transition Year may enjoy Science and have slightly more positive overall attitudes, the year itself does not appear to be making any discernable difference in improving pupil attitudes, in particular towards the Physical Sciences. In fact, when Junior Certificate and Transition Year pupils’ reasons for choosing a Science subject at senior cycle were compared, the Transition Year pupils were more negative about the Physical Sciences, and more positive about the Biological Sciences, significantly so in some cases.

8.2.2 What are pupils’ experiences of making subject choice decisions for Senior Cycle? Where do they get their information from and what type of information/advice do they receive?

In order to fully address this research question results from pupils and students surveyed in Phase 2 were drawn upon (Chapter 7). In addition, the wealth of data provided by the interviews with Transition Year Science teachers and Co-ordinators in Phase 3 was also employed in order to fully engage with and answer the research question.

Pupils have varied experiences of making their subject choices for senior cycle. A key finding to emerge from this study was associated with the type and manner in which pupils received information regarding their subject choice decisions. Both the pupils and students who took part in this research study had different experiences of career-guidance based on their schools gender intake, type, whether the school offered the Transition Year Programme, and whether or not the pupils took the Transition Year Programme.

Pupils and third level students who took Transition Year had greater access to a career-guidance teacher, and also had more information regarding careers in Science. This is also true for third level students who attended schools that offered the Transition Year Programme, even if they themselves did not take it. Perhaps this is because the year offers more time for discussion about subject choice and careers (Jeffers 2008). A whole-school approach is recommended within Transition Year
schools (Department of Education 1993c, Smyth et al. 2004, Jeffers 2008;2011), this approach is also viewed as crucial for the success of a good career-guidance programme and successful subject choice for pupils (Lam and Hui 2010). These researchers (Lam and Hui 2010, pp. 230-231) recommend a variety of systems be inbuilt to a schools career-guidance programme, which are: a whole school approach, a caring and supportive school culture, balanced workload for teachers, an emphasis on the teachers role in guidance, and collaboration and coordination between subject teachers and the school guidance specialists. The type of career-guidance received by Transition Year pupils and Junior Certificate pupils was significantly different, with overall, Transition Year pupils having far greater access to career-guidance of all types. Aptitude testing was the main type of career guidance offered to Junior Certificate pupils; this was significantly greater when compared to the Transition Year pupils, who experienced guidance in the form of ‘conversations about their career options’, and their ‘future subject choices’. Perhaps these different approaches between the two years is indicative of the highly standardised Junior Certificate curriculum, which offers little time for extra-curricular options such as career-guidance (Smyth et al. 2004, Smyth and Hannan 2006). It is of considerable interest to the author that the primary sources of information regarding careers in Science are Science teachers and Career-guidance teachers. The Science teacher is a significantly greater source of information for Transition Year pupils, as are parents and visiting speakers, when compared to Junior Certificate pupils. The author would suggest that if one is seeking to promote the uptake of both Science subjects at senior cycle and careers in Science, it is important to highlight and inform these teachers about the various options and opportunities in this area; particularly as pupils cited their ‘future career’ and ‘future third level course’ as the most important factors in their subject choice decisions. These findings are in line with trends in the research which suggests that teachers’ involvement in the career-guidance of their pupils has long been an integral part of a teachers remit (Watts and Kidd 2000, Lam and Hui 2010, p. 220) Slightly more than half the Transition Year pupils found their career-guidance sessions to be useful, these pupils considered the sessions to be significantly more useful than their Junior Certificate counterparts. Similar trends were reported when comparisons were drawn among third level students who had taken the Transition Year, with those who had not taken the year. Those who took Transition Year were more satisfied with the level of information provided by their career-guidance
The author proposes that this finding is linked to the differences in the type of career-guidance that the pupils receive depending on which programme they are in. The less standardised and more personal career-guidance offered in the Transition Year may be more appealing and satisfactory for pupils, compared to the formalised nature of aptitude testing. The ROSE study (Matthews 2007) indicated that pupils value the interpersonal aspect of employment, as much as the financial, and that if one wants to encourage pupils to take Science subjects one must engage pupils with the ‘human context’ of Science and jobs within this sector. Bingham (1998) notes that there is a wealth of educational and occupational information, which has applications in the area of career-guidance. Aptitude testing may inform students of what career they may be suited to in the future, but may not offer the information needed to make appropriate subject choice decisions for the senior cycle. The key influences on pupils when it came to making subject choice decisions for the Leaving Certificate were parental, though the Transition Year and pupils’ gender did have an effect on these results. Transition Year pupils were more highly influenced by their mothers and friends. The nature of the year, with the opportunities for closer social interactions may account for friends being more influential for this cohort of pupils. Similar to findings in research (Dryer 1998) fathers were also more influential for male pupils, when compared to female pupils.

When teachers attempt to bring context-based, relevant Science into their classroom, they are allowing their pupils a deeper insight into the real life work of a scientist. Many of the Science teachers interviewed as a part of the Case Studies conducted in Phase 3, (Chapter 6) noted that they did just that. As such, the Science teachers become a much more effective and positive source of information about Science and careers in the field (Lam and Hui 2010). The move away from ‘school Science’ towards ‘real world Science’ offers the pupils a invaluable information for their future decisions regarding both subject choice for Senior cycle and their careers (Cleaves 2005). These activities, and associated teaching and learning methodologies, in all of the forms that they take can be promoted and inhibited by many external factors, as well as the internal factors, by the teacher themselves. Budget constraints and time available with pupils were cited by teachers in all three phases of this research as limiting factors. Internal factors would include a lack of teacher preparedness to organise their classes and to teach in an innovative fashion.
as well as the teachers’ own philosophy regarding what they believe is suitable content for their pupils.

Overall, there are distinct differences displayed among the different cohorts of pupils and students surveyed in this study, with those who have taken the Transition Year experiencing a more positive career-guidance experience than those who were not offered or did not take the year. Only 46.5% of Transition Year pupils agreed or strongly agreed that Transition Year Science had given them a good idea about the type of work that a scientist does. 56.2% stated that Transition Year Science had given them a good idea about the type of third level courses available in the area, and 62.9% felt that Science in the year had given them a better idea of the type of jobs available in Science. Pupils who have taken the Transition Year, despite being more satisfied overall with their career-guidance, still stated that despite having a more positive experience of career-guidance in the Transition Year they were still lacking information relating to the type of careers available in Science, the type of third level courses available and what those careers would entail.

### 8.2.3 Why do pupils who choose to take science at Senior Cycle choose to do so? What effect/impact, if any does taking Transition Year Science have on these decisions?

The key influences on pupils’ subject choice decisions for senior cycle are parental, followed by their career-guidance teacher and their friends. Pupils’ mothers were slightly more influential for those in the Transition Year than for those in Junior Certificate. The primary difference between the Transition Year and Junior Certificate pupils was the stronger influence of friends on Transition Year pupils. Similar findings were found for third level students, with the chief influence on their decision on what third level course to take being parental. Similar to the traditional model of academic choice (Eccles 1984, Smyth and Hannan 2006, Politis et al. 2007), the pupils’ reasons for choosing a Science subject were related to their perceived ‘value of the subject’ for their career, future third level course, interest, and performance expectations.

The principal reasons for choosing a Science subject for senior cycle were to do with the pupil believing that the subject would be a requirement or useful for their future
third level course or career. This was particularly true for the Physical Sciences. Pupils who chose to take a Biological Science subject for the Leaving Certificate mentioned reasons such as their interest in the subject, liking and enjoying the subject, and their future career. Pupils felt that the main reason to take one of the Physical Sciences was for their future third level course or career, followed then by interest in or liking the subject. The factors that would promote or prohibit the pupils’ future study of the Science subjects gave an insight into the pupils’ feelings and perceptions of the Science subjects. In line with the literature (Matthews 2007), pupils gave positive reasons for studying Biology, such as their interest in the subject, a good teacher teaching the subject, that it was a useful subject, it is the easiest Science subject, it would offer good career prospects, and finally because it could be a third level course requirement. Pupils’ painted a different picture of Physics and Chemistry, citing them as difficult, boring and not interesting. Only one fifth of pupils said that interest in these subjects would be a factor that would encourage them to study the subjects, compared to three-quarters of pupils who would be encouraged to study Biology due to an interest in the subject. As Matthews (2007, p. 87) noted “if one wants to attract more young people into science, it is essential to engage them with the human context of science”. The pupils’ perception of the Physical Science being difficult and boring (Department of Education and Science 2002) appears to persist into and beyond the Transition Year, where little is being done to convince pupils otherwise. While a higher proportion than the national average of Transition Year pupils planned to take up a Science subject at senior cycle, the year did not encourage them to make this choice according to 47.3% of them. Results indicated that female pupils were significantly (p = 0.014) more encouraged, by the Transition Year, to take up a Science subject for the Leaving Certificate. Those pupils who were encouraged by the Transition Year to take a Science subject for their Leaving Certificate had a higher planned uptake of Physics, Chemistry and Biology than those who had not been encouraged to take a subject by the Transition Year. There was a significant association between whether or not the Transition Year had encouraged pupils to take a Science subject for the Leaving Certificate and them deciding to take one. A significant positive association was found between pupils who enjoyed their Transition Year Science class and those who were encouraged to take a Science subject by the year. Therefore, perhaps when the Transition Year Science class is taught in an enjoyable fashion it does encourage...
uptake of Science subjects for Leaving Certificate. This finding was echoed among the Case Study schools, with both Transition Year Co-ordinators and Science teachers agreeing that Transition Year Science improved pupils’ overall perceptions of the subject, and perhaps in some cases this did result in a greater uptake of the subjects at Leaving Certificate, among pupils who may otherwise not have taken the subjects. However, the Case Study schools involved in this research were chosen due to their prior identification as exemplars of good practice, or due to them ranking among the top 35 schools for uptake of Leaving Certificate Chemistry (Waldron 2009). This therefore may be the reason for above average percentages of pupils in these schools taking up Science subjects for their Leaving Certificate. Perhaps this is less to do with the Transition Year and more to do with the whole school ethos towards Science, particularly in the schools studied who were identified from the top 35 schools for uptake of Leaving Certificate Chemistry. The findings of this study echoes other studies (Milner et al. 1987, Smyth and Hannan 2002, Cleaves 2005, Lyons 2006, Smyth and Hannan 2006, Reardon et al. 2010), indicating that pupils are driven by exam culture, and choose subjects that they feel that they will do well in and will aid them in their future. That is not to say that interest and enjoyment does not play a part in the pupils’ decisions, but it is not the principal factor.

8.2.4 How do Transition Year pupils’ experiences of Science differ from Junior Certificate pupils’ experiences of the subject?

The experiences of the Transition Year pupils differ greatly from those of the Junior Certificate pupils, with regard to how Science is treated. In the Science classroom, Transition Year pupils experience more practical classes per week than their Junior Certificate counterparts, with Junior Certificate pupils averaging 1 class per week, and Transition Year pupils experiencing two or more practical Science classes per week. A contributing factor in this may be the tight curriculum constraints experienced in the study of Junior Certificate Science, leading to less time to move outside the curriculum into investigative practical classes. There is also a clear disparity between the types of activities carried out amongst pupils in the two types of Science classrooms. Given the very different nature of these two years one would expect to see this; however it is of interest to the author to note what particular
activities are carried out frequently or infrequently by the two different cohorts of pupils. The traditional classroom activities of writing in, answering questions from, or reading from a Science text book are experienced by Junior Certificate pupils with a far greater frequency than Transition Year pupils. These trends are also noted in terms of assessment, with Junior Certificate pupils experiencing quite traditional assessments, such as written and oral tests with a far greater frequency than their Transition Year counterparts. In fact, these types of assessment are experienced relatively rarely by Transition Year pupils. In line with the Transition Year guidelines (Department of Education 1993c) the Transition Year pupils experience a wide range of non-traditional activities in their Transition Year Science classrooms. They also experience most of these activities with a greater frequency than Junior Certificate pupils would experience them. Transition Year pupils experience the following activities with a greater frequency than Junior Certificate pupils:

- Discussions about Science;
- Watching the teacher use apparatus to demonstrate ideas;
- Working yourself with apparatus/materials;
- Carrying out experiments;
- Doing project work;
- Doing group work;
- Having pupil presentations;
- Having debates;
- Watching T.V./DVDs/Videos on scientific phenomena;
- Using a computer;
- Using the internet;
- Listening to visiting speakers;

However Junior Certificate pupils appear to be going on field trips, visiting scientific industry or businesses and attending seminars more frequently than Transition Year pupils. This is an unusual finding. The type of experiences that the Transition Year pupils are having in their Science classrooms are somewhat positive, the activities that are carried out more frequently than their Junior Certificate counterparts are conducive to discovery learning (Bennett 2003, p. 75), active learning (Kyriacou 1998, p. 39), problem-based learning (Kelly 2000, Bennett 2005) and context based

The Transition Year guidelines state Transition Year Science “Teaching / learning methods should stress pupil activity” (Department of Education 1993c, p. 27). This does appear to be the case among the teachers and pupils surveyed during the course of this research. However, the author would argue that the Transition Year is an opportunity to encourage the development of communication skills, scientific literacy and critical thinking in Science. Activities which would promote these skills (pupil presentations, debates, Science fairs and competitions, visiting scientific industry, field trips, visiting speakers and attending seminars) are rarely or never encountered by Transition Year pupils. As noted by the A.S.T.I. (1992, p. 16) the Transition Year is an opportunity to introduce pupils to “scientific skills and to promote a greater awareness of the role of science in their lives”.
Main Findings

- Transition Year pupils are more positive about their experiences of Transition Year Science than those they had in Junior Certificate Science. However, when compared to Junior Certificate pupils, there are no differences in the pupils’ level of enjoyment of their Science class.

- There were differences in pupils’ reasons for taking Science subjects at senior cycle, with Junior Certificate pupils being more positive about Physics and Chemistry and Transition Year pupils being more positive about the Biological Sciences.

- Transition Year and Junior Certificate pupils have very different experiences when choosing subjects for their senior cycle. Both pupils and students who took the Transition Year were more positive about and satisfied with the information and career-guidance they received, when compared to Junior Certificate pupils.

- The Transition Year pupils have a more innovative and varied classroom experience than their Junior Certificate counterparts, however Transition Year pupils still experience certain teaching and learning methodologies infrequently.

- A positive Transition Year experience in Science can encourage pupils to take a Science subject for their Leaving Certificate, this effect is experienced more by female pupils.

- The external influences on pupils subject choice decisions are parental, followed by their career-guidance teacher and friends. Friends and mothers are more influential for Transition Year pupils than Junior Certificate pupils.
• The internal influences which drive pupils to choose subjects for their Leaving Certificate are related to their perceived value of the subject. This value is described as: related to future career, future third level course, or interest or liking of the subject. The Physical Sciences are frequently cited as difficult by pupils, which may link to their self-efficacy.
8.3 How Transition Year Science teachers utilise the Transition Year

8.3.1 What do Transition Year Science teachers teach in their Transition Year Science classes? What is their rationale for teaching the content that they teach and how is it taught?

Transition Year Science teachers teach a substantial assortment of topics in the Transition Year, in a wide variety of ways. The Transition Year Guidelines state that any Science module taught in the year should “explore the links between science and society” (Department of Education 1993c, p.27). This STS focus has been shown to be highly effective for Transition Year pupils (Smith 1998, Smith and Matthews 2000).

A majority of teachers (Phase 1 & 2 & 3, 68.5 ± 2.5% for all three cohorts) teach from the Leaving Certificate Science syllabi in their Transition Year Science classes. The results indicated that significantly more female teachers implement this practice, than male teachers. Interestingly the length of time teachers have been teaching has no effect on whether they teach from the Leaving Certificate Science syllabi in their Transition Year Science classes. Biology, in particular is taught by the largest proportion of teachers. Perhaps the higher number of Biology subject specialists in schools contributes to this or it may be due to the schools’ timetabling and organisation of the subjects in the year. Over three-quarters of the teachers teach from the Leaving Certificate Science syllabi more than occasionally, frequently or very frequently. This practice is carried out, in the main, to allow pupils a taste of Science subjects for their Leaving Certificate; although close to a fifth of teachers do so in order to decrease the workload for the Leaving Certificate. The teachers interviewed in Phase 3, although working in schools that have above average levels of Science uptake for senior cycle, added a further insight into their rationale for teaching from the Leaving Certificate Science courses: they believed that it aided the pupils, due to the time constraints in the senior cycle science syllabi, to prepare pupils for the Leaving Certificate course. Jeffers (2008;2011) noted that schools had a tendency to domesticate the Transition Year Programme. The author would propose that this is also true for subjects taught within the programme. This is an
CHAPTER 8: DISCUSSION

understandable, but potentially dangerous practice as it may lead to the Transition Year becoming ‘colonised’ by the Leaving Certificate (Jeffers 2007b, pp. 302-305). There appears to be a firmly held belief among teachers, that the Transition Year can present the ‘fun’ side of Science, and that teaching from the Leaving Certificate courses in the year will provide the pupils with a realistic view of the subject before they choose it for their senior cycle. The results indicate that the teachers do not teach exclusively from the Leaving Certificate Science syllabi in the Transition Year, despite a pronounced percentage of teachers carrying out this practice with regular frequency. Perhaps this practice is due to the level of ambiguity in the Transition Year Guidelines (Department of Education 1993c, Jeffers 2008).

A wide variety of other subjects and modules within the domain of Science are also taught. Modules, typically from the University of Limerick’s ‘TY Science’ or PharmaChemical Ireland’s range of TY modules are also utilised by teachers in the Transition Year Science classroom.

In line with the results from the cohort of Transition Year pupils, the teachers surveyed in Phase 1, 2 and 3 put a considerable focus on practical work and this is carried out regularly, with over half the teachers in Phase 1 teaching practical classes in every class or in every double class. Nearly three quarters of teachers in Phase 2 include practical work as a regular feature of their Transition Year class, including it at least once a week. The literature (Kampourakis and Tsaparlis 2003, p. 321) suggests that practical work and demonstrations have much merit and offer value when utilised in the correct fashion. The frequency of inclusion of practical work is linked to laboratory access, with the trend being noted by the author that indicates that the more often teachers had access to the Science laboratory the more frequently practical classes were held. The Science teachers in Phase 3 indicated that they also put a significant focus on project and practical work, as well as linking topics in Transition Year Science class to current, relevant topics in Science, as suggested in the ‘NICE approach’ advocated by Childs (1994). The type of teaching and learning activities that teachers (Phase 2) utilise in their Transition Year Science classes are comparable to those reported by the pupils and students who took the Transition Year. Practical and experimental work, active learning, group work, project work and research were all employed frequently by the Transition Year Science teachers. Teachers also frequently avail of ICT in terms of their own usage of PowerPoint slide shows, and pupil use of computers in the Transition Year Science classroom.
However, teachers are not making use of team teaching, involving their pupils in debates or role play, having visiting speakers, seminars, or entering their pupils in Science competitions. These activities all have significant merit in terms of the pupils’ development as scientifically literate citizens, and their lack has implications which hold beyond the immediate domain of the Transition Year Science classroom, and relate to teachers’ practice as a whole (Mooney Simmie 2007).

The results of this study begs the question as to why do teachers, teaching Transition Year Science, use the particular teaching methodologies and teach the content reported in this study? The author would purpose that the answer lies within the area of teacher preparedness. The question of how prepared teachers are to teach Transition Year Science was not one of the initial research questions, however, as this study progressed the theme of ‘teacher preparedness’ was one which could not be overlooked. Every element of this study involving teachers (both Science and Transition Year Co-ordinators) indicated that there is a severe lack of preparation for teachers involved in teaching in Transition Year Science. Nearly three-quarters (71.3%) of teachers (phase 2) believe that they did not receive adequate pre-service education in order to teach in or design their own Transition Year Science curriculum. This was also found to be true in the teacher interviews carried out in Phase 3. Curriculum design and development is not an effortless or trivial process, as Tytler (2009, p. 1806) notes “It is not enough to write more convincing or more carefully crafted curriculum documents.” Teachers Professional Development in the form of both pre- and in-service education, aspires to be a transformative process, which should create a “sense of cognitive dissonance” thus_challengeing teachers to re-engage with their teaching practices, pedagogy and subject knowledge (Park Rogers et al. 2007, p. 528). However, the findings from this study indicate that 70% of teachers stated that no in-service education was provided in the area of Transition Year Science, and only a third of teachers had ever attended such in-service education. The more experienced the teacher (the longer they have been teaching), the more likely they were to have attended these sessions. Perhaps in-service education that was provided in Transition Year Science was not equal in terms of geographical location, or perhaps education has not been provided in more recent years. This unequal provision of education leaves teachers inadequately prepared to take on the mantle of curriculum development, and teachers appear to have become entrenched in familiar and traditional practices (Hargreaves et al. 1996, Hargreaves
Teachers interviewed for the Case Studies in Phase 3 echoed these sentiments and added insight and a voice to the issue. These teachers remarked that the ability to develop a curriculum suitable for Transition Year Science comes from experience and that while there are some in-service courses provided, they are not provided in the formal context, in that they are provided as optional courses by the PDST. Nearly all of the teachers believed that there was a requirement for further Transition Year Science in-service education, and that if such courses were provided that they would attend. The majority of teachers are confident in their ability to design a course or curriculum for their Transition Year Science classes, despite their lack of training. This confidence was linked to the length of time that the teachers had been teaching, though the trends were not linear. Teachers who had been teaching for 5-10 years and over 15 years displayed the highest levels of confidence, whereas more recently qualified teachers had the lowest levels of confidence. The author believes that these results indicate that teachers’ experience in teaching in the Transition Year leads to greater levels of confidence in the design of a curriculum for the year. However, given that such a high proportion of teachers are teaching from the Leaving Certificate Science syllabi the question should be asked: Is this confidence misplaced? Two-thirds of teachers find the Transition Year Second Level Support Service (TYSLSS) helpful to them in their teaching of Science in the Transition Year. The issue of formal pre-service education and continuous professional development arises out of these findings. The findings lead to further questions being asked, particularly in terms of pre- and in-service education for teachers, especially younger teachers entering the system. If one wants to break the cycle of teaching the standard content in the standard fashion, support must be provided for teachers (Halton 2004, Park Rogers et al. 2007).
8.3.2 Are there any factors that impact on how Science teachers teach Transition Year Science?

Teachers’ background and subject specialism emerged as a theme throughout this research. The teachers surveyed in Phase 2 of the study were asked about their own degree and subject background. The majority had a background in the Biological Sciences, either alone or in combination with another subject. Perhaps this explains the high levels of the Biological Sciences taught in the Transition Year, and the pupils’ significantly more positive perceptions of the Biological Sciences. The body of research surrounding this area indicates that a teacher’s background and subject specialism can affect their confidence and practices (Shulman 1987, Van Driel et al. 2002, Kind 2009).

Although, a higher proportion of teaching from the Leaving Certificate Science syllabi was found among teachers with a background in Biology, Chemistry and Agricultural Science, these were not significant. The lowest instances of teaching from the Leaving Certificate Science syllabi were among Physics teachers.

The theme of teachers teaching within their subject specialist area emerged from the Transition Year Science teacher interviews, as part of the Case Studies conducted within schools. Research (Hashweh 1987, Davis 2003, Kind 2009) has indicated the importance of subject specialists teaching within their own field.

The teachers (Phase 3) who took part in this study believed that it was of vital importance that teachers taught within their subject specialism in Transition Year Science, in order to allow their pupils a better experience of the subject, and to encourage better uptake of the subjects at Leaving Certificate. In light of research within this area, the author would propose that the Biological Sciences are the most popular Science subjects among Transition Year pupils because the majority of teachers in this study have a background in the Biological Sciences, and therefore are more comfortable teaching these subjects. The Transition Year is currently doing little to reduce the dominance of Biology at senior cycle. Other limiting factors are the time, and pupil absenteeism, although none of these were found to be significant.
Main Findings

- The majority of Transition Year Science teachers teach from the Leaving Certificate Science syllabi in their Transition Year Science classes. This is commonplace for a variety of reasons: to allow pupils a taste of subjects for their Leaving Certificate, to reduce the workload, because it was believed that the syllabi were relevant and topical.

- Teachers also use a wide variety of curriculum materials in their Transition Year Science classes, which they believe can improve the experiences for pupils.

- A strong emphasis is placed on practical work in Transition Year Science, with it being conducted frequently in the Transition Year Science classroom.

- There is a serious lack of training and preparation among teachers who are teaching in Transition Year Science classes.

- Teachers’ confidence in developing their own syllabus for their Transition Year Science classes increases as they become more experienced.

- Teachers’ subject background has a slight effect on the subjects offered and taught by the teacher, and whether the Science subjects will be taught from the Leaving Certificate Science syllabi.

- Other limiting factors were a lack of time, and pupil absenteeism.
8.4 The role of Science in Transition Year schools

8.4.1 Do schools display differences in how they provide Science and guidance on subject choice both in the Transition Year, and subsequently at senior cycle?

Differences in terms of provision of Science subjects observed in this study among the differing types and gender intakes of schools. Given the reports on provision of school subjects (Smyth and Hannan 2002;2006), this was to be expected. There were also differences observed between the different datasets. However, the fact that both the cohort of third level pupils in Phase 2 and the sample of teachers involved in Phase 1 of the study were not considered to be representative, must be taken into account. Both the teacher and pupil survey carried out in Phase 2 of the research were considered to be nationally representative and these sources were in agreement, showing similar trends in terms of school provision of Science in the Transition Year.

The individual Science subjects (Physics, Chemistry and Biology) were more frequently provided in Community and Comprehensive schools, and schools with single-sex gender intake. Science, as a combination and continuum of the Junior Certificate type subject was provided in Vocational and Co-educational schools. Biology was the most prominently featured subject in all schools, with Physics and Chemistry experiencing lower provision.

Career-guidance was only examined in pupil and student surveys, and therefore only these findings can be discussed. There were high levels of Career-guidance in all schools. However, differences between the schools were apparent. Secondary schools offered greater levels of aptitude testing, as did Single-sex gender intake schools. Less formalised career guidance was provided in Vocational, Community and Comprehensive schools, and schools with a Co-educational gender intake. This more informal career guidance was provided in the form of a ‘chat about career options’ or a discussion about subject choice. Interestingly, pupils attached more value to this type of career-guidance than the more formal pen and paper aptitude testing. This may be due to the pupils feeling that they were having their voices listened to and their opinions heard (Kessels et al. 2006, Jeffers 2007b).
Science subjects in the Leaving Certificate were not provided equally. Biology was offered in all schools surveyed, but Physics and Chemistry were not provided as uniformly among the differing school types and gender intakes. The highest levels of provision of Physics were in Vocational and Single-sex male schools. The highest levels of provision of Chemistry were also in Vocational schools and Single-sex female schools. Pupils’ planned uptake of these subjects for their Leaving Certificate also varied among schools. Pupils in Secondary schools, Community and Comprehensive schools and Single-sex schools had the greatest intentions to take Biology, which whilst also being the most popular Science subject, also had the greatest levels of planned uptake. Pupils in Vocational and Co-educational schools had the greatest planned uptake of Physics, whilst higher levels of pupils in Secondary and Single-sex female schools indicated that they planned to take Chemistry. Interestingly, there were disparities in terms of the reported provision of Science subjects at Leaving Certificate among teachers and pupils, with teachers reporting a far greater provision of Science subjects in the schools. Teachers surveyed in Phase 2 of this study reported 100% provision of Biology, which is in line with the pupils’ results, however, they report greater than 90% provision of Physics and Chemistry in their schools at Leaving Certificate. The Case Study schools reported similar results, with all schools providing all of the three primary Science subjects at Leaving Certificate, although School 5 was struggling to achieve the numbers to run a senior cycle Physics class. These findings are in line with current trends in provision in Irish schools (Smyth and Hannan 2002,2006, Association of Secondary Teachers Ireland 2010, Deapartment of Education and Skills 2010). This leads to an interesting question: Are pupils aware of the provision of these Science subjects in their school? Why do pupils believe that Physics and Chemistry are commonly not offered at senior cycle? Do schools discourage pupils from taking up the less popular Science subjects so they can be dropped?
8.4.2 How is Transition Year Science treated and perceived within schools?

In order to fully and engage with and address this research question, the author believed it necessary to gather results from all data sources in this study, as each gives an insight into how the Transition Year and Transition Year Science is treated and perceived within schools. The Transition Year appears to be held in quite high regard by pupils, third level students, Science teachers, and Transition Year Co-ordinators alike. The primary reasons for this level of regard is that all believe that the year offers an opportunity for the development of pupils’ maturity, personal and social skills and offers a programme that is relevant to the real world and real life experiences. Once again, the Transition Year Science teachers and Co-ordinators offered their own insight with both of these cohorts stating that the year was important in their schools. Fee-paying schools were the most likely to make the year compulsory, as it offers another year of fees in what was traditionally a six-year system, but it is still planned with precision and held with high esteem in these schools. There is a belief that the Transition Year adds to the whole school atmosphere and ethos (Smyth et al. 2004, Jeffers 2008;2011), and this is picked up in this study: Transition Year Co-ordinators and Science teachers note that the year has a positive impact on the entire school. It develops pupils’ maturity, preparing them for the rigours of the senior cycle and adult life, and promotes linkages between the school and the wider community. A whole school and whole staff emphasis are important within the year. Staff within Transition Year schools are positive overall about the Transition Year, but this is sometimes tempered with some negative views. Co-ordinators have suggested that perhaps this is due to some teachers being ‘out of their depth’ and uncomfortable with the ‘looseness and flexibility’ that the Transition Year offers teachers and pupils alike. As Jeffers (2008) the aims and goals of the Transition Year are contradictory, leading to both ‘innovation and resistance’ within schools.

Science in the Transition Year is also held in high esteem by teachers and Co-ordinators in all phases of this study. Results from the teacher surveys conducted in Phase 1 and 2 of this study indicate that Science is given a degree of prominence in all schools surveyed. Nearly all teachers involved in this study believed that the subject was an important facet of the Transition Year. There is a belief among
teachers that it can encourage uptake of Science subjects at Leaving Certificate level. Science is provided in some shape or form in the Transition Year in all schools, which, the author believes indicates recognition of the importance of the subject. However, when this is examined further there is a large degree of variation in how Science is provided within the schools, which is to be expected given the autonomous nature of the Transition Year. How the subject is provided gives an insight into the regard it is held within the school itself. Biology is clearly given the most prominence in the Transition Year, being offered to the greatest extent in schools, and most frequently taken (among all the Science subjects offered) by pupils and third level students, who took the year. A high degree of practical work is a common thread throughout all sources of data, indicating that teachers and pupils are provided with regular laboratory access. Schools and teachers appear supportive of the subject, and this is picked up by the pupils who enjoy it and find it ‘fun’ and ‘interesting’.

The results from the Case Studies conducted in Phase 3 add a new layer of understanding of the treatment of Science and perception of the subject within the schools. The Case Study schools, all display significant levels of interest and regard in the Science subjects in terms of organisation and provision within the schools. Transition Year Science in these schools is advocated as important among the teaching staff and Transition Year Co-ordinators; however, this is a whole school ethos in favour of Science which permeates throughout these schools. It is difficult to say whether this is caused by the Transition Year, or whether the varied Transition Year Science programmes are a product of this whole school ethos towards Science. This idea of Science being embedded in a schools ethos and culture is a vital aspect for the promotion and uptake of the subject, with pupils taking their cue from the school staff and their peers in the years ahead of them. In order to promote Science uptake and as a subject that can be enjoyed for the intrinsic pleasure it offers an inquiring mind the subject cannot be isolated within the Transition Year. An effective Transition Year requires a whole school approach (Smyth et al. 2004, Jeffers 2007b), and this is true also of an effective Transition Year Science programme. In order for true change to occur and become sustainable a culture and ethos around this needs to become embedded in the school, staff and pupils (Crooks and McKernan 1984, Eisner 1992, Dalin 1993).
Main Findings

- Schools differ in terms of how they provide Science in the Transition Year, with single-sex Secondary and Community and Comprehensive schools tending to offer the individual Science subjects, and Co-educational and Vocational schools offering a more general Science subject. Biology is the dominant subject at senior cycle also and was offered in all schools examined.

- Biology is the dominant Science subject offered at both Transition Year and senior cycle in schools.

- Teachers report greater levels of provision of Science subjects, than pupils do, at both Transition Year and Leaving Certificate.

- Career-guidance and information on subject choice was provided differently among the various types of schools. Secondary and Single-sex schools were more likely to offer guidance in the form of an aptitude test, while Community and Comprehensive, Vocational schools and Co-educational schools offered information and personal communication as career-guidance for pupils. Similarly Transition Year schools followed the type of career-guidance offered in the Vocational and Community and Comprehensive schools, whereas non-Transition Year schools offered aptitude testing. Pupils were more satisfied with their career-guidance in Transition Year schools.

- The Transition Year and Transition Year Science are both held in high esteem, but there are cases of ‘innovation and resistance’ in schools. Therefore, the overall school ethos and culture is important, in terms of embedding a successful Transition Year programme into the school.
8.5 Conclusion

Science is considered to be a ‘vital’, ‘essential’ and ‘important’ element of the Transition Year Programme. The subject is held in high regard among Science teachers and Transition Year Co-ordinators, though many teachers struggle to develop their own curriculum for the subject, from the Leaving Certificate Science syllabi. This is experienced by teachers across the board, despite their subject speciality, or length of time teaching, although it is slightly less of an issue among those with a background in the Physical Sciences. The key factor behind this is, in the authors view, a lack of teacher preparedness, both through pre-service training, and in the availability of in-service training in subject specific areas of Transition Year Science.

While pupils enjoy their Science class, this is true for all pupils, regardless of whether or not they have taken the Transition Year. The year offers greater and more varied career guidance and information on subject choice, yet many pupils still remain ignorant about potential opportunities for careers in Science and what these careers or third level courses involve. There is a slightly greater level uptake of Science among pupils who take the Transition Year. However, the current uptake trends of Leaving Certificate Science are continuing, to perhaps a greater extent among Transition Year pupils, with the majority opting to take Biology. Pupils’ experience of Science within the year does little to alleviate the perception that the Physical Sciences are difficult, boring and uninteresting. Perhaps if more context-based, inquiry-based, real-world Science was experienced by the pupils in their Transition Year, linking to real life careers and experiences, the perception of Science would shift, and pupils may realise that if they wish to take a Science subject for their Leaving Certificate, that Physics and Chemistry are viable and useful options also.
CHAPTER 9: CONCLUSION
9.1 Introduction

This is the final chapter of the thesis and within this chapter the author collates the main findings from this study. The chapter aims to provide a summary of the thesis, the main issues that emerged from the study, and the implications that these hold for the teaching and learning of Science in the Transition Year. Following this the significance of the study and the contributions that it has made to the field of Science education are discussed. Finally, the recommendations arising from this thesis are presented as are the author’s suggestions for future work emerging from this study.

9.2 Significant overall findings and conclusions

The focus of this study was to establish the place of Science in the Irish Transition Year, by viewing it through the eyes of the key players: the pupils, teachers, and schools. There has been little research conducted in the examining the place of Science in the Transition Year, although there have been a number of small scale research and curriculum development projects. These projects were primarily intervention programmes, aimed at improving pupils’ attitudes towards the subject and uptake of the Sciences at senior cycle. This work was undertaken to examine the place of Science in the Transition Year, due to the scarcity of research in this area, other than Lally’s (2007) small-scale study which provided an initial baseline. The findings from Lally’s work motivated the author to take the research further. As this study progressed a number of significant findings emerged.

The Transition Year pupils have a far more varied and innovative classroom experience, than their Junior Certificate counterparts, which promotes positive attitudes towards Transition Year Science. Yet, overall, the attitudes displayed by pupils towards Science are similar to those reported in the literature (Millar and Osborne 1998, Smyth and Hannan 2002, Osborne et al. 2003, Kessels et al. 2006, Politis et al. 2007), particularly in terms of gender differences. Many activities, such as discussion, debate and self-directed learning, which are integral to becoming a scientifically-literate citizen and to understanding the nature of Science, are not being experienced to a great extent by pupils in either the Transition Year or Junior Certificate Science classrooms.
Pupils who have positive experiences in their Transition Year Science class are more likely to take a Science subject at senior cycle. This is a more pronounced effect for female pupils than male pupils; therefore Science in the Transition Year appears to have a more positive effect on female pupils, perhaps in exposing them to the more human and real-life aspects of Science.

Pupils at all levels do have an enjoyment and appreciation of Science. Transition Year pupils are more positive about their experiences of Transition Year Science than their Junior Certificate Science experiences, but when compared to Junior Certificate pupils there are no differences in their overall attitudes towards Science in general.

The majority of teachers (%) teach from the Leaving Certificate Science syllabi in their Transition Year Science classroom, contrary to the Transition Year Guidelines. Teachers employed this practice for a wide variety of reasons. Despite teaching from the Leaving Certificate Science syllabi regularly, teachers also use a wide variety of other resources and teaching materials.

The length of time teachers have been teaching has no significant impact on their practices, in terms of the content that they teach. However, their confidence in their ability to design and develop a syllabus for their Transition Year Science class is linked to the teachers’ experience and their length of time teaching, with more experienced teachers being the most confident in their ability to design and develop a syllabus for their Transition Year Science class.

A strong theme which emerged from this research is the lack of teacher preparation in their subject area for teaching in the Transition Year. Most science teachers have training in the various teaching and learning methodologies and approaches recommended for the teaching of Science, but being able to develop their own syllabus by drawing on these approaches does not appear to have been explicitly dealt with in either pre- or in-service instruction.

Budget and finance emerged as issues among the Transition Year Co-ordinators, and they indicate that it is becoming more difficult to sustain the year in its current form. All schools charge their pupils to take the Transition Year, and therefore this limits...
pupils from a less well-off background, who might otherwise like to take the year. The whole experience of the Transition Year is being affected by this, as school trips, speakers and events must be curtailed somewhat. This impacts on the Transition Year as whole, not just in Science. The Transition Year, while a fantastic opportunity for schools, pupils and teachers, favours the middle classes, and pupils from working class background miss out on the opportunities and benefits that the year has to offer (Jeffers 2002, Smyth et al. 2004).

Schools differ in their provision of Science subjects at both Transition Year and senior cycle. Biology is the most predominant subject at both of these levels, and this prominence may explain why more pupils choose the subject for both the Transition Year and senior cycle. Teachers report a slightly greater provision of Science subjects when compared to pupils, but this is may be due to pupils not knowing that certain Science subjects are provided, particularly the Physical Sciences. Many schools offer the subjects, but do not actually put on a class unless a minimum number of pupils is reached.

The provision of subject information and career-guidance also varies widely among schools, with pupils placing more value on guidance that comes in the form of personal communication about future subjects and career choices.

The external factors impacting on pupils’ subject choices are their parents, career-guidance teacher and friends, although both friends and mothers are more influential for Transition Year pupils. The internal factors are the pupils’ perception of subject’s value to them. This value is depicted in terms of a future third level course, career, or interest in the subject. In particular the Physical Sciences are cited as difficult boring subjects, and when pupils choose to take them they primarily do so in the belief that it is necessary for their future course or career.

A strong emphasis on is placed on practical work in the Transition Year Science classroom and this is acknowledged by all, with this type of work being conducted very frequently.
Chapter 9: Conclusion

The Transition Year has an impact on the whole school, and its effect permeates throughout the schools’ culture and ethos. Planning is the key to a successful Transition Year and Transition Year Science programme, this works best as a whole-school and whole Science department approach.

In general Science is well regarded and valued in the Transition Year. Pupils enjoy the subject, and positive experiences of the subject in the year can lead to improved attitudes and uptake of the subjects for senior cycle. Both teachers and co-ordinators hold the subject in high esteem, but as Jeffers (Jeffers 2007b;2008;2011) notes in much of his work on the Transition Year, there is a case of both ‘innovation and resistance’ within the year, and within Science in the year.

The Transition Year succeeds in being an important and engaging school year for pupils, teachers and schools. Science is viewed as an integral component of the year, with a high value attached to it, but practices within Science provision, and teaching and learning illustrates a resistance to change even when curriculum content is fresh and different.

Domestication of the year takes place in schools, and this is evident throughout the Case Study schools and pervades Science within the year as well. Science in Transition Year is in a state of continual flux, and teachers appear to be undecided about what it should be and the attributes of the year. This is in part due to the ambiguity of the guidelines (Department of Education 1993c), which while explicitly stating on one hand that the Transition Year is ‘NOT’ a part of the Leaving Certificate programme, and teachers’ should not teach Leaving Certificate material, it then also states that the Transition Year does not need to exclude Leaving Certificate material, but the Leaving Certificate material should be chosen with a view to “augment the Leaving Certificate experience, laying a solid foundation for Leaving Certificate studies” (p. 5). It is easily seen how teachers and schools receive mixed messages. This ambiguity has led a majority of Science teachers to teach from the Leaving Certificate Science courses in the year. It has become the ‘norm’ to teach aspects of the Leaving Certificate in the Transition Year, with teachers not wanting their pupils to fall behind. Teachers are also wary of departing from familiar practices and express concern regarding teaching outside the box, without the

9.3 Contributions of the research to the field of Science Education

This study has been conducted in order to provide a baseline in the area of Transition Year Science. It is the first study of its kind in Ireland. Throughout this study results have emerged indicating the high levels of standardised teaching from the Leaving Certificate Science syllabi that are commonplace in many Transition Year Science classrooms. Further investigation has indicated that the root of the issues regarding how Science is taught in the Transition Year may lie within the area of teacher preparedness. Through highlighting these issues the author has opened up further avenues for investigation and implementation. The research is therefore relevant to those involved in teacher education at both pre-service and in-service levels. Research in the area of teacher CPD is relevant at both national and international level.

At a local level the research is significant to those involved in Science education at the University of Limerick (one of Ireland’s largest producers of Science teachers) and those who provide CPD courses for Science teachers in the National Centre for Excellence in Mathematics and Science Teaching and Learning.

The research has further added to the national and international body of work available on pupils’ subject choice decisions, and the factors that impact on these decisions.

This study has provided an insight into the practices of Science teachers in Ireland, complementing research already available in this field and is the first study to examine the practices of teachers in the Transition Year Science classroom.

At an international level this study has the potential to make significant contributions in the field of curriculum innovation and development, particularly in relation to the
practices of teachers and schools when given the unique opportunity of teaching without the constraints of a syllabus.

9.4 Recommendations arising from the study

The author would like to make a number of recommendations, based on the findings of this research study:

- Research, both through this study and that of others, has shown that the perceived value of a subject for pupils’ future career or third level course is a significant factor when making subject choice decisions. Therefore the author recommends that there be a focused provision of information on third level Science courses and careers arising from Science-based courses for parents, pupils, Science teachers and career-guidance teachers.

- A whole school and whole departmental (subject departments within schools) approach should be taken when planning the year. Planning the Transition Year is an important feature of a successful year, and if subject departments do not cooperate and coalesce in the planning stages, fragmented and uneven experiences of Science in the Transition Year can ensue.

- Third level institutions involved in Science teacher training must provide adequate preparation to enable pre-service Science teachers to deal with the demands of developing a Transition Year Science syllabus.

- There needs to be greater CPD opportunities for Transition Year Science teachers, either through the Transition Year sector of the PDST or through one of the Science sectors. These training sessions must focus, not only on the development of appropriate Science syllabi for the Transition Year, but also on teaching and learning methodologies appropriate to teaching Science in the year. An emphasis on teachers’ SMK and PCK is recommended in order to equip them to take on the challenge that a year like the Transition Year can present. These CPD opportunities cannot be one-off ventures. A sustained programme should be developed, which will allow teachers the opportunity to change their practices and behaviour. In order for this to be achievable the CPD programme must take place over a significant period of time, involving a long-term commitment from
CHAPTER 9: CONCLUSION

teachers, and leading to the development of a community of shared practice among those involved.

- A teacher support network should be developed for Transition Year Science teachers. This could be developed on a regional basis, either through the PDST, or through the Irish Science Teachers’ Association. An online forum is also needed to allow teachers to communicate, and share resources with each other.
- There should be equity of access to all Science subjects in all schools at all levels of education. This is an area which needs to be examined at policy-maker level.
- Junior Certificate Science should be made a compulsory subject at junior cycle.
- The Transition Year makes heavy demands on teachers in terms of their abilities, time and resources. There needs to be equitable and sufficient provision of resources, technical assistance and time for teachers to plan and prepare.

9.5 Directions for future work

Having completed this doctoral dissertation the author wishes to reflect on the findings and propose that further avenues of research related to these findings be explored. The following topics are suggested as areas that would merit further investigation:

- A more detailed study exploring the content taught and methodologies utilised in Transition Year Science classes. The teacher can play a significant role in the development of pupils’ attitudes towards a subject. Classroom practices of Transition Year Science teachers need to be explored further. If the Transition Year inspires a more innovative and diverse style of teaching, does this translate into teachers’ practices outside of the Transition Year classroom, where they are constrained by the curriculum? The author acknowledges that a study of this nature would not be benefited by further quantitative results, and suggests that a large scale case study be undertaken.
- Pupils’ perceptions of Science subjects, in particular the Physical Sciences, are not very positive. Is this due to the teaching and learning methodologies being employed by Science teachers? Do the teaching and learning methodologies of Science teachers have an effect on pupils’ subject knowledge, and conceptions?
• An examination should be made of both Science teachers and career-guidance teachers’ knowledge regarding potential career avenues following from third level courses in Science. Following on from this study, there is potential to investigate if improving these teachers’ knowledge regarding careers in Science, or careers following on from Science-based third level courses, translates into their teaching, thus improving pupils’ uptake of the subjects.

• A targeted intervention study should be done in Transition Year Science, focusing on the key factors that pupils consider when choosing subjects for senior cycle, encompassing key aspects of scientific literacy, CBL, IBL, potential careers in Science and STS, in order to promote attitudes and uptake patterns in the Physical Sciences.

• A study should be undertaken, merging the data that has been collected over several years of feedback, on the University of Limerick’s ‘TY Science’ collection of modules. There have been 10 modules produced to-date, and 2 more are currently being developed. The feedback from teachers and pupils, over several years of pre- and post- questionnaires, teacher diaries and continuous teaching experiences with the modules provides a wealth of data to explore. This research could be developed further into a collaborative study examining the Transition Year Science resources available to teachers, and the effects that these resources are having on pupils’ attitudes to Science and subject choice.

• Both Transition Year and Science have been regarded as somewhat elitist in the literature and in the public perception of them (Jeffers 2002, Smyth and Hannan 2002, Smyth et al. 2004, Jeffers 2008;2011). It was beyond the scope of this study to examine this further, but the author recommends that further work could be carried out to examine whether the Transition Year as an effective vehicle for boosting the uptake of Science subjects among pupils from disadvantaged backgrounds.

• An examination of teachers’ SMK and PCK through the lens of Transition Year Science. What impact do teachers’ SMK and PCK have on their ability to develop their own Transition Year Science syllabi?

• Can a targeted pre- and in-service programme in the development and adaptation of Science curricula reduce Transition Year Science teachers’ reliance on the Leaving Certificate Science syllabi in their practices?
9.6 Conclusion

Throughout this study the place of Science in the Irish Transition Year has proved difficult to examine in isolation, and this led to the methodological approaches taken throughout this research. It is difficult to pinpoint the place of Science within the Irish Transition Year because of the nature of the year. Like the Transition Year itself, Science in the year has the potential to be a relevant, imaginative, and challenging innovation. The subject is enriching for pupils, teachers and the whole school. However, there are undertones of resistance. This resistance is not explicit, but is recognisable and detectable as inadvertent and unconscious practices and attitudes. The Transition Year and teaching Science within the year asks much of Science teachers, particularly without them having adequate preparation for teaching their subject within the year. The practices required to teach Science in the year are the type of practices that one would hope to see at all levels of Science teaching within all classes, but are significantly different to those actually utilised in Science classrooms in other programmes. Pupils, teachers and schools will only get out what they put into their Transition Year Science classes and a whole school approach is required. That is not to say that there are not exemplars of good practice of teaching within the Transition Year Science community, but unless these practices are shared the subject will not reach its full potential, not just in producing future Scientists, but to make Science an essential component of pupils’ general education. A paper that the author co-authored was entitled ‘Teaching Science in the Irish Transition Year: A Wasted Opportunity?’ (Hayes et al. 2010). The question ‘Is teaching Science in the Transition Year a wasted opportunity?’ is one which has come to mind once again at the end of this thesis. The author would like to suggest that in light of the findings of this study that the answer is both yes and no; teaching Science in the Transition Year is sometimes a wasted opportunity. There are many teachers and schools around the country who value Science and the role of the subject within the Transition Year. There are many teachers who are teaching Transition Year Science in an innovative and interesting fashion, bringing the subject alive for their pupils. However, there are also a great many teachers and pupils who are experiencing Science in the Transition Year as an extra Leaving Certificate year with slightly more practical work. Teachers in the main are utilising the year well and pupils do recognise significant differences between their Junior Certificate and Transition Year Science classes but
opportunities to do much more with the year are being missed. To produce scientifically-literate, creative and critical thinkers, with positive attitudes towards Science, should be the goals of Transition Year Science classes. This can only be achieved with further shared practices and support for all involved in teaching this subject in the year.

9.7 Personal Reflection

This section of the chapter has been included in order to allow the author to reflect on this research study. In particular the author wishes to reflect upon her own experience in undertaking this work, and how her viewpoint has changed and evolved throughout the course of this investigation. Initially the author would like to reflect upon the strengths and weaknesses of this study.

The framework of research questions, which have directed this study, were clear and were guided by an overarching research aim. This focus is, in the author’s opinion, a strength of the research, particularly as the subject matter is complex and has the potential of being viewed through many different lenses. The clear overall aim and research questions aided in keeping the work focused. In addition the methods utilised to conduct the study allowed for the best possible overview of a complex issue. Both the Transition Year, and Science within this year, are difficult to describe in a generalisable fashion, yet this was one of the goals of this work. In order to achieve this, the author utilised both the positivist and the interpretive perspective, which allowed the author to both generalise the results and to delve deeper into the issues than is traditionally achievable when utilising only the positivist approach.

However, the author also recognises that there were weaknesses associated with this study. Primarily, the initial scope of the study was narrow, and did not take into account the possibility of this research being expanded into a PhD study. Work originally began on this project due to a gap being present in the literature, and funding becoming available from PharmaChemical Ireland. This funding initially came with a specific research brief, which was not only to examine and evaluate the place of Science in the Transition Year, but also to evaluate Irish Science teachers’
usage of PharmaChemical Ireland’s Transition Year Science modules. Without this initial funding this research study may never have begun however, it also limited the scope of the research, with its emphasis being on Science teachers’ use of resources. This original, narrower focus became problematic as the study progressed and it was decided to broaden the scope of the research in light of the initial literature review and early findings. The problem of a limited scope became apparent as the possibility arose of transferring from the Master’s register to the PhD register. Much thought, planning and time was spent discussing how to broaden the scope of the research in an appropriate fashion. A change in the source of funding allowed far greater freedom in work beyond this point in the study. It was at this point that the author would claim to have begun to fully take ownership of the project and the direction in which it was to proceed. In hindsight, the author is aware that, when initially undertaking the project, the potential of the research area merited consideration for a PhD study.

When conducting the research the author also encountered issues when conducting the Case Studies in Transition Year schools. In the spirit of the overall study, the author would have preferred that the Case Study schools had been selected at random from the overall Department of Education and Science Transition Year schools list. However, due to issues with access to the schools this was not feasible. The author recognises that this is the nature of research, but believes that if it had been possible to conduct a randomised set of Case Studies then it would have strengthened the overall study.

Having examined and evaluated the place of Science in the Irish Transition Year, the author believes that it is a much more complex topic, than was originally presumed. The Transition Year is an important year in the Irish education system, presenting both the benefits and pitfalls that a curriculum-free year has to offer. When this research was initially undertaken the author had a more naïve view of both the Transition Year and of Science within this year. The author perhaps wore ‘rose-tinted’ glasses and believed that the Transition Year was a wonderful opportunity for teachers and pupils alike to embrace Science and all that the subject had to offer, and that this could be done universally. The author assumed that this study would lead to a simple answer regarding the place of Science in the Transition Year. However, as the research progressed the author realised that the Transition Year, and how subjects
are organised and taught within the year, is a complex, many-faceted issue. She realised that it was not her role as a researcher to judge the place of Science in the year, how it was organised or taught within schools, but merely to report and uncover what was occurring on the ground in schools and how this was occurring. The adoption of this approach allowed the author to report the views, opinions, and overall findings in a non-judgemental and unbiased manner. Schools and teachers have issues with Transition Year Science for a wide variety of reasons, from lack of pre- and in-service education in utilising the year to ambiguity on the overall scope and aims of the Transition Year. In order to improve Transition Year Science the author would suggest that teachers receive improved pre- and in-service education relating to this curriculum-free year and the potential of Science as a career should be highlighted. Both the concepts of subject matter knowledge (SMK) and pedagogical content knowledge (PCK) are crucial in preparing teachers to move beyond the constraints of a mandated syllabus towards being comfortable and confident enough in their own professional practice to develop their own syllabi.

In more general terms, the completion of this study has given the author a broader, more rounded view of teaching and learning as a whole. While the author was aware of the issues surrounding schools, and teaching and learning of Science, she had not reflected seriously upon these issues until she undertook this study. This study has served to give the author a more complete view of the complexities that surround schools as educational organisations and of her own strengths and weaknesses as a researcher.


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