Can the learning of a topic in Craft Theory be improved for Carpentry and Joinery Apprentices by using a tool of Digital Media as a learning resource?

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A thesis submitted for the award of Degree of Master of Arts in Digital Media Development in Education.

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University of Limerick, October 2009
Declaration:

“I hereby declare that this project is entirely my own work and that it has not been submitted for any other academic award at any other university”.

Signed: ______________________

David Loftus

Student I.D. Number: 0571768

Date: _______________________
Abstract

David Loftus

Can the learning of a topic in Craft Theory be improved for Carpentry and Joinery Apprentices by using a tool of Digital Media as a learning resource?

Developments in information and communication technology (ICT) have had a major impact on all areas of human development. Governments have recognised the enormous significance of knowledge society developments on the educational sector, their economy and society in general. In Ireland the government have introduced initiatives in ICT which have delivered ICT hardware and software, access to the internet in schools and provided ICT training for teachers in the integration of ICT in teaching and learning. It is within this context that an investigation into whether a tool of digital media works effectively as an assistive learning resource for Carpentry and Joinery apprentices.

By means of a case study approach carried out in an Institute of Technology which caters for Carpentry and Joinery apprentices, staff and students were surveyed on whether a software learning resource improved their teaching and learning experience. The research was based on both qualitative and quantitative data and made use of a wide range of data sources of questionnaires, interviews and a focus group.

A review of current literature indicates that ICT has not had the impact that was expected since its introduction into education. Some of its failings have been due to government policy, school policy, access to enough reliable equipment, support structures and the teacher’s resistance to ICT. It was found that there is a need for a sound pedagogical approach before any implementation of ICT. There must be a balance between technology and solid educational theory and instructional design must be at a level which satisfies the different learning styles of the learner.

The findings indicated that the learning resource was effective for the students and had enhanced their learning and overall learning experience. On the other hand staff were not as positive about the learning resource with just over half the staff agreeing that the learning resource would enhance the students learning experience. By using the learning resource the students became more self-directed and self-paced with their learning. The software individualised the learning and thus served both weaker and better-able students equally well.

The conclusion drawn from this research is that the requirement for additional training on both the basics of ICT and the different pedagogical approaches were seen as a major requirement by staff to improve the overall learning experience of the students. The educational requirements of apprentice carpentry and joinery students needs to be closely monitored in order to ensure each individual has the necessary skills to remain competitive, as they may need to up-skill in order to secure quality employment in the future.
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<td>AONTAS</td>
<td>National Association of Adult Education</td>
</tr>
<tr>
<td>BECTA</td>
<td>British Education Communications and Technology Agency</td>
</tr>
<tr>
<td>CD</td>
<td>Compact Disc</td>
</tr>
<tr>
<td>CD-ROM</td>
<td>Compact Disc – Random Operational Memory</td>
</tr>
<tr>
<td>CERI</td>
<td>Centre for Educational Research and Innovation</td>
</tr>
<tr>
<td>DES</td>
<td>Department of Education and Science</td>
</tr>
<tr>
<td>DETE</td>
<td>Department of Enterprise, Trade and Employment</td>
</tr>
<tr>
<td>DVD</td>
<td>Digital Versatile Disc</td>
</tr>
<tr>
<td>E.C.D.L.</td>
<td>European Computer Driver Licence</td>
</tr>
<tr>
<td>FÁS</td>
<td>Foras Áiseanna Saothair (Training and Employment Authority)</td>
</tr>
<tr>
<td>ICT</td>
<td>Information and Communication Technologies</td>
</tr>
<tr>
<td>IDA</td>
<td>Industrial Development Authority</td>
</tr>
<tr>
<td>IT</td>
<td>Information Technology</td>
</tr>
<tr>
<td>I.T.</td>
<td>Institute of Technology</td>
</tr>
<tr>
<td>NCTE</td>
<td>National Centre for Technology in Ireland</td>
</tr>
<tr>
<td>NFQ</td>
<td>National Framework of Qualifications</td>
</tr>
<tr>
<td>NIACE</td>
<td>National Institute of Adult Continuing Education</td>
</tr>
<tr>
<td>NPADC</td>
<td>National Policy Advisory and Development Committee</td>
</tr>
<tr>
<td>NWS</td>
<td>National Workplace Strategy</td>
</tr>
<tr>
<td>OECD</td>
<td>Organisation for Economic Co-operation and Development</td>
</tr>
<tr>
<td>PC</td>
<td>Personal Computer</td>
</tr>
<tr>
<td>SPSS</td>
<td>A statistical and data management package for analysts and researchers</td>
</tr>
<tr>
<td>USA</td>
<td>United States of America</td>
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<tr>
<td>VLE</td>
<td>Virtual Learning Environment</td>
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<td>VTOS</td>
<td>Vocational Training Opportunities Schem</td>
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1.1 Introduction

Educational systems around the world are under increasing pressure to use ICTs to teach students the knowledge and skills they need in the 21st century (UNESCO, 2002; p.10). ICTs, which include digital technologies such as computers and the Internet, have been portrayed as potentially powerful enabling tools for educational change and reform. When used appropriately, ICTs help expand access to education, strengthen the relevance of education to the increasingly digital workplace, and raise educational quality by, among others, helping make teaching and learning into an engaging, active process connected to real life (BECTA, 2004). A variety of other factors also play key roles in influencing the learning opportunities provided by ICT; such as Government policy, hardware and software, the teacher’s pedagogical beliefs and the educational ethos of the school (Goos et al., 2003 cited in BECTA, 2003 A).

Since the introduction of ICT into schools a recurring issue has been to understand the opportunities which ICT provides for making the curriculum more accessible, for extending the curriculum, for motivation and greater pupil control against the many constraints on teachers in their use of ICT. These constraints include lack of ICT skills, lack of curriculum fit and more than anything the lack of time and energy to re-think everyday routines (Cuban et al, 2001).

The benefits of ICT for teaching and learning are also expressed as reasons for increasing use of ICT in schools (BECTA, 2003 B). Among the reported benefits are gains in increased motivation, improvement in teacher training by providing access to more and better educational resources, offering multimedia simulations of good teaching practice and increasing productivity of non-instructional tasks (NCCA, 2004).

Teacher professional development is absolutely essential if technology provided to schools is to be used effectively (BECTA, 2005 B). Simply put, spending scarce resources on informational technology hardware and software without also financing
teacher professional development is wasteful. Teacher training in the use and application of technology is the key determining factor for improved student performance in terms of both knowledge acquisition and skills development enabled by technology (NCES, 1999).

ICT training can help overcome barriers, but unfortunately it often fails to do so. While a lack of time and training are major obstacles (Cox et al. 1999), according to Berube et al. cited in a BECTA report suggests there are weaknesses in the design and delivery of many courses (BECTA, 2005 B). By focusing on basic ICT skills, training fails to prepare teachers to integrate ICT in their pedagogy (BECTA, 2003 A).

1.2 Statement of Topic
The aim of this study is to investigate what factors combine to improve the learning of Carpentry and Joinery apprentice students which can be used to best effect in the apprentice education system.

1.3 Objectives of the study
- To determine the effect the learning resource software has in relation to the enhancement of learning for the students.
- To investigate the change which occurred in learning for each individual learner
- To discover if ICT/digital media is effective as a learning tool and to explore what educational potential computers and digital media may hold.
- To identify what professional development educators require and to discover what level of commitment do they have for integrating ICT/digital media in education.

1.4 Proposed solution
To improve the learning of Carpentry and Joinery apprentice students the researcher intends introducing a tool of digital media into apprentice learning. The research will compare the learning when using a tool of digital media (learning resource software CD) compared to using traditional learning methods. The study will examine what is
occurring inside the classroom, including the educators’ and learners’ attitudes and beliefs in relation to computers and digital training media.

1.5 Rationale for research
The benefits of ICT to education which were highlighted in the OECD (2007) report and the Irish government policies for ICT in Irish Education Schools IT2000, and A Blueprint for the Future of ICT in Irish Education, (N.C.C.A., 2004) all deal with the integration of ICT in primary and second-level schools. There appears to be little existing research in relation to apprentice students within Ireland, and only a very small quantity that is available internationally. The fact that these reports highlight the benefits of the use of ICT in education in only primary and second-level schools gives this researcher the impetus to investigate whether or not digital media will improve the learning for apprentice students in Ireland.

Apprentice learning in Australia, New Zealand, Canada, Austria and Great Britain run apprenticeship programme similar to the programme in Ireland. Of these countries the only real evidence of the use of digital media was in Canada where they used a virtual campus and in Australia where they used a flexible delivery apprentice training. These systems used video conferencing and web broadcast to convey their lecture whether the students are on or off the campus. Although these lectures would be interactive they would not be suitable for the practical experience the students require doing apprenticeships. The apprentice system in Ireland requires the students to attend all lectures on campus.

The researcher has chosen for this study, one class of thirty two phase four Carpentry and Joinery apprentices attending an Institute of Technology. The researcher works with apprentice students in this institute and has access to facilities, staff and apprentices required for this study.

1.6 Significance of the study
This study is significant as little research currently exists into the effect digital media has upon the learning for Apprentice students in Ireland to date. The concept of using learning resource software is relatively new to the majority of educational institutions
teaching apprentice students. Therefore, research which explores the advantages of
digital media will help to raise awareness among those who are unaware with its
potential applications and benefits within their educational setting. To illustrate the
potential of digital media software the research investigated the impact of using the
technology on apprentice students. The findings which have resulted from the case
study have the capacity to impact upon the method the apprentices are currently being
taught.

1.7 Research Methodology
The case study approach was identified as the best suited to the researcher’s purpose
because case studies focus on one or a very limited number of instances or examples
of a particular phenomenon in order to construct an in-depth account of what happens
or happened during that instance (Yin 1984, p.23). The emphasis is on depth rather
than breadth of study (Cohen et al. 2000). Within the case study method a variety data
collection instruments may be used, including questionnaires, interviews, focus
groups, observation records and tests (Cohen et al, 2000).

Each of the data collection instruments used during the case study has a specific role
within the study. Each serves the function to develop the study further, but differs in
how this is implemented.

Pre-training and post-training questionnaire – the pre-training questionnaire was
designed in order to gain knowledge of each student’s educational background and to
determine each student’s existing computing ability. The post-training questionnaire
was designed to establish what, if any, was the effect of the software in relation to the
enhancement of learning for these students.

Focus groups - The focus groups discussed the use and effectiveness of digital media,
and investigated any issues which arose during the course.

Observation - During the test, a structured observation schedule was maintained, and
data was recorded every five minutes to find out what quantity and type of interaction
occurred in the classroom at that time.
Domain reference test - both the test and control groups were given a domain reference test at the end of the study. It was used to examine whether the digital media affected the grades achieved by each group of students.

Interviews - these were carried out to inform the researcher on the range of issues relevant to the study.

The importance of validity and reliability are considered, as is the process of triangulation. Validity for this study should be achieved by cross-referencing several sources of reliable data. The prerequisite for reliable research is that it is carried out on a similar group of respondents and in a similar context, and for this study these prerequisites were followed. Triangulation is often used in research to ensure that a thorough investigation has been carried out. It involves multiple sources of data collection to support and validate findings. A good methodology will serve to enhance validity and reliability of the research and triangulation will also assist the process (Cohen et al., 2000). Ethical issues attached to conducting research are also addressed and the limitations of the study were also discussed.

1.8 Structure of Thesis
Chapter Two examines government initiatives with ICT and the potential benefits and resistance of ICT in education. It then focuses on the characteristics of adult learners which is an important aspect of this study, since adult learning characteristics are significantly different from that of younger learners. Theories of learning are then discussed. Instructional design models are investigated and discussed, with the most suitable model being reviewed and analysed in greater depth. This chapter closes by drawing together conclusions which are supported by existing research from relevant authors.

Chapter Three reviews different research styles and focuses on the case study method of research. The research questions are set out and the data collection methods are identified and discussed. The importance of validity and reliability are considered, as
is the process of triangulation. Ethical issues and limitations of the research are also discussed and conclusions are drawn.

Chapter Four presents the research findings for the study. Accuracy of the findings was a key consideration and triangulation was used to cross-reference results, where possible, in order to validate them. Some of the additional findings are located in the Appendices.

Chapter Five discusses and analyses the findings, and draws together material from the literature review, methodology and findings.

Finally, Chapter Six draws conclusions from the entire project and proposes recommendations.
Chapter 2
Impact of ICT on teaching and learning in apprentice education

2.1 Introduction
This chapter reviews the research that has already taken place regarding the impact of Information and Communications Technology (ICT) on education. An examination of Government policies and ICT implementation, changes in curriculum, provisions for ICT infrastructure, teacher professional development have all taken place. The characteristic of adult learners is considered important in this study since adults learn in a different manner to that of young learners.

In order to make digital media effective various theories of learning, instructional design strategies, instruction design models and human computer interaction are all researched.

2.2 ICT in Education
Over the year's massive developments in ICT has had a major impact on all areas of human development. ICT is used to cover a range of tools and equipment. It includes hardware and software devices and programmes that allow people to access, retrieve, store, organise, manipulate and present information by electronic means (such as personal computers, assistive technology, scanners, digital cameras, multimedia programmes, image editing software, database and spreadsheet programmes) (Buckingham and McFarlane 2002). Students use technology to communicate and share data with each other throughout the world by using email, You-tube, Face book, Twitter etc. They can access information using the Internet, video conferencing and a range of other assistive technologies.

ICT is impacting on learning in many ways right through to the way in which education is delivered to the student, so much so that Brophy stated that “ICT is changing fundamentally the nature of the learning experience” (Brophy 2001, p.130) from the way in which students and educators interact with one another, to the way students interact with each other and their learning material.
Many policy documents have been published and various governments have also set out numerous blueprints on education reform and on ICT in education since the mid-1990s (Mulkeen, 2003). These policy initiatives brought with them a variety of strategic implementation priorities that differ from country to country, depending on the socio-economic and political context. Such educational strategies may involve, amongst others, changes in curriculum, assessment, provision for ICT infrastructure, teacher professional development and technical and pedagogical support for teachers (CRITE, 2000).

The Irish government has also recognised the enormous significance of knowledge society developments on the educational sector, the Irish economy and society in general. In the last decade, two Irish government policies for ICT in Irish Education: *Schools IT2000, A Policy Framework for the New Millennium* (1997) and *A Blueprint for the Future of ICT in Irish Education* (2001) have been published and implemented (N.C.C.A., 2004).

IT 2000 was a policy framework for the integration of ICT in first and second-level schools. The core objective of the policy was to put in place an infrastructure to ensure that: ‘pupils in every school should have opportunities to achieve computer literacy and to equip themselves for participation in the information society; support is given to teachers to develop and renew professional skills, which will enable them to utilise ICT as part of the learning environment of the school’ (DES 1997).

In order to achieve these aims IT 2000 targeted action on classroom resources and infrastructure, teacher skills development and support, policy and research. A key objective was to ‘bring about a national partnership involving schools, parents, local communities, and third-level institutions together with public and private sector organisations to meet the project’s ambitious aims’ (DES, 1997).

In a report by the Organisation for Economic Co-operation and Development (OECD, 2007), which looked at ICT and school reform in nearly one hundred schools in twenty-two countries on a case study basis, the teacher was identified as being central to the adoption and usage of ICT. The impact of ICT on educational quality and the effect on the learning, along with other benefits, all flow from the way in which the
technology is used. The same tools in the hand of another teacher will produce different outcomes. The adoption and implementation of ICT is a process of educational change, as opposed to it being a technical issue. It is to do with teacher beliefs and pedagogical practices, as much as it is about infrastructure and bandwidth (OECD, 2007).

Current research in the UK offers valuable insights into how ICT may in fact be a key trigger in supporting teachers. Teachers who engage with ICT in the classroom have reported that ICT is more suited to support collaborative learning, active learning, enquiry etc. than traditional teaching pedagogies. Additionally, the use of ICT in education has consistently been equated with other broader educational goals (N.C.C.A., 2004).

Teachers use ICT resources to support the classroom curriculum, for example, using tools such as word processing to create written materials, using presentation and authoring software to present projects and using drawing and painting software to enhance work in visual arts. In certain ways, learning with ICT may be perceived as a natural integration of ICT with existing classroom processes (N.C.C.A., 2004).

When introducing change into any organisation where the methods are already tried and tested will meet with resistance. ICT in education is no exception to this so an examination of the resistance to the use of ICT is required in order to understand how ICT can be best implemented.

2.3 Resistance to the use of ICT
Perceptions of computers as difficult to use may be as much to do with lack of confidence as with the hardware or software itself (Snoeyink & Ertmer cited in BECTA 2003 C). Negative experiences affect perceptions of the ease of use and relevance of ICT, reducing confidence and increasing anxiety. Computer anxiety and anxiety about change are key factors limiting teachers’ use of technology. Underlying these anxieties is fear of embarrassment when using computers and fear of losing professional status through a downgrading of traditional pedagogical skills (BECTA, 2003 C).
A recurring issue throughout the history of ICT in schools has been to understand the opportunities, which ICT provides for making the curriculum more accessible, for extending the curriculum, for motivation and greater pupil control against the many constraints on teachers in their use of ICT. These constraints include lack of ICT skills, lack of curriculum fit and more than anything the lack of time and energy to re-think everyday routines (Cuban et al, 2001).

The integration of ICT in teaching and learning requires a fundamental rethink for many teachers of their own deeply held beliefs and attitudes in relation to pedagogy, styles of teaching and their subject (Moursund, 2005).

In Ireland, according to Mulkeen teachers see the curriculum, and particularly assessment requirements, at second level, far more important than the integration of ICT for schools. Evidence of this is found in a survey of Irish post-primary teachers, where it is reported that just 29% of the teachers surveyed had used ICT in teaching (Mulkeen 2000).

The lack of access to ICT equipment due to organisational factors such as the deployment of computers in ICT suites rather than classrooms is creating a barrier for teachers (Cuban et al. 2001). Another factor has to be taken into account, namely free time in which to plan and prepare for the integration of ICT into teaching. It is difficult for teachers to upgrade their ICT skills, receive training on how to incorporate ICT into their teaching, plan and prepare for that integration in an already busy schedule (BECTA, 2003 A).

In a BECTA report investigating ICT and e-learning in further educational colleges, it was found that the re-use of electronic learning material is widespread, often with no modifications occurring from year to year or even from one class to another (BECTA, 2005 B). BECTA identifies this as a negative point, and says that it is surprising that this is occurring, since Further Education colleges in the UK offer staff development programmes which are chiefly designed to support staff who desire to develop or adapt electronic learning materials (BECTA, 2004).
For a teacher to change their teaching methods and incorporate technology they must have time, confidence, motivation, training, the proper technology supported environment, and the incentive to do so. (Loxley, Julien, 2005). In a Becta 2004 report that cited Dawes who suggested that even with the optimal situation these changes do not take place over the course of a year. It is reasonable to expect a 3-5 year period for the teacher to develop appropriate curriculum and incorporate technology that effectively supports it.

Innovation and adaptation are costly in terms of time developing effective pedagogy around ICT involves significant input in terms of planning, preparation and follow-up of lessons (Cox et al., 2003).

Now that there is a better understanding of the resistance to the use of ICT the potential benefits of ICT in education needs to be identified in order to encourage those that resist ICT to use it in the future. The next section examines the benefits of ICT in education.

2.4 The potential benefits of ICT in education

The potential benefits of ICT for teaching and learning are also expressed as reasons for increasing use of ICT in schools. Among the reported benefits are gains in increased motivation, improvement in teacher training by providing access to more and better educational resources, offering multimedia simulations of good teaching practice and increasing productivity of non-instructional tasks (NCCA 2004 cited, White, Ringstaff & Kellet, 2002).

Technology can speed up and increase the efficiency of a range of non-instructional teacher activities such as student attendance, grading, textbook distribution, and preparation of administrative reports. It also can enhance the productivity of basic instructional tasks, such as preparing lesson plans and class outlines, developing quizzes and examinations and writing up comments on student papers and reports. (Making better connections, 2001).
There is an often-expressed fear that technology will replace teachers. I can say emphatically and unequivocally, IT WON’T. The information highway won’t replace or devalue any of the human educational talent needed for the challenges ahead: committed teachers . . . and, of course, diligent students. However, technology will be pivotal in the future role of teachers.

—Bill Gates, The Road Ahead (p185).

In order to encourage teachers the effective development of ICT skills and knowledge and enhanced use of ICT in schools, requires a holistic approach comprising appropriate training in terms of skills, knowledge, relevance to educational goals, and priorities, and delivery, ready access to ICT resources and ongoing support and advice to encourage progression beyond any formal training (SOEID 1998).

The approach of ‘any time, any place’ access to learning, and lifelong learning, presents schools and colleges with the challenge of delivering a personalized curriculum. ICT provides a powerful tool to meet this challenge, but to take advantage of its potential both individual teachers and institutions will need to embrace a more learner-centered pedagogy (BECTA, 2003 B).

The full cost of running an information system can be broken down into a number of broad headings, including: computers; network infrastructure, software, support and maintenance, user training. Too often the hardware purchase price is assumed to be the major part of the investment (CRITE, 2000). According to Wahl in a discussion paper on cost, utility and the value of technology, it is recommended that funding for ICT should be allocated in the ratio of 70:30 on teacher training to equipment (Wahl, 2000). Projects fail when planners invest heavily in hardware and software, but minimally in hiring and training competent people, thus leaving the project without expert support and guidance.

A range of organisational factors, such as the commitment of the head of school and good forward planning, were correlated with successful implementation of the use of ICT and the commitment of staff played a pivotal role in the process. However, the implementation of new technology needs to be managed properly, to ensure the continued commitment of teachers (Cox et al., 2003).
Integrating ICT into the school curriculum in a meaningful and creative way is a challenge for all schools. Comprehensive ICT integration takes time and necessitates appropriate school planning in order for the process to take place in a truly co-ordinated and developmental way. ICT integration is a never-ending journey rather than a once-off activity (ICT Planning, 2002).

Educational technology is not and never will be, transformative on its own. It requires teachers who can integrate technology into the curriculum and use it to improve student learning. In other words, computers cannot replace teachers, teachers are the key to whether technology is used appropriately and effectively (NCREL 2000). The effective teacher, as in any other profession, plays a number of roles: she/he is not only a classroom practitioner but is also a manager, a planner, and a learner. For the teacher this means updating their subject knowledge as well as their skills and knowledge of new approaches to teaching, managing and planning. In other words, the effective teacher must also be an effective learner (SOEID 1998).

Teacher professional development is absolutely essential if technology provided to schools is to be used effectively (BECTA, 2005 B). The next section examines what professional development has been taking place and suggests what needs to be done in the future.

2.5 Professional Development of Educators using ICT

Access to ongoing and appropriate ICT professional development is a prerequisite for all teachers if they are to improve their confidence and competence in using ICT to meet the needs of all their students (NCCA, 2004).

ICT training can help overcome barriers, but unfortunately it often fails to do so. While a lack of time and training are major obstacles (Cox et al. 1999), research suggests there are weaknesses in the design and delivery of many courses. By focusing on basic ICT skills, training fails to prepare teachers to integrate ICT in their pedagogy (BECTA, 2003 C). There is a need for differentiated training, taking into account teachers’ varying levels of computer experience and learning styles.
Training for educators generally is limited to use of specific programs or software packages beyond that, educators are on their own. No institution will train educators to be technology experts and few will provide them with a broad understanding of the requirements and potential of the technologies they will be using. Improvisation is currently the norm in this field (The Campus Computing Project 2000).

Whether ICT succeeds or fails in education depends on teachers’ skills and their priorities for future development. Without the right kind of teacher guidance, ICT is of little value for students. For teachers to use ICT creatively and effectively in the classroom, they must have some previous experience of using it themselves (Mulkeen, 1998).

Teacher professional development is absolutely essential if technology provided to schools is to be used effectively (BECTA, 2005). Simply put, spending scarce resources on informational technology hardware and software without financing teacher professional development as well is wasteful. Teacher training in the use and application of technology is the key determining factor for improved student performance in terms of both knowledge acquisition and skills development enabled by technology (NCES, 1999).

Without training, teachers will not use technology (Wahl, 2000). The result of under funding teacher professional development is that a lot of technology provided to schools is never used; it sits in boxes or closets, gathering dust and becoming obsolete. This is more than a loss of potential learning and skills acquisition; it is also a waste of the resources used to procure technology in the first place (NCES, 1999).

Teachers need to be encouraged by administrators, particularly their head of school, to participate in training activities. Administrators need to ensure that teachers have adequate time to participate, and do not have to sacrifice too much personal time to do so. But, in addition to time allocation, supervisors should recognize publicly teachers who successfully complete professional development courses. This provides immediate personal reward to teachers, raises their status in the eyes of their peers,
and encourages others to participate (Improving Professional Development Practices, 1998).

Traditional one-time teacher training workshops have not been effective in helping teachers to feel comfortable using technology or to integrate it successfully into their teaching (Haddad, 2000). There is a need for a more definite set of guidelines outlining the type of teacher training that is most appropriate and how it will integrate ICT and pedagogy successfully.

According to the Becta’s, 2003 report ‘Improving Learning and Teaching with ICT’ the key to successful teacher professional development programs is a modular structure, corresponding to different levels of teacher experience and expertise using technology. Adapting materials to teachers’ comfort level and starting points is essential. In this way, teachers new to technology can be exposed to the full series of professional development modules, while those further along on the learning curve can enter where their knowledge and skills stop, and help their less technology-savvy colleagues along (BECTA, 2003 B). The basic principles of adult learning also should be incorporated into the training program. This implies that the program should be highly social and cooperative, with opportunities to share experiences and combine instruction with discussion, reflection, application, and evaluation. In addition to these principles, technology enables an even more collaborative approach and maximizes peer-to-peer sharing of the challenges, frustrations, advantages, and successes of using technology to teach and learn (Carlson, 2002).

Effective training that is appropriate in terms of skills, knowledge, relevance to educational goals and priorities, and delivery, ready access to ICT resources and ongoing support and advice to encourage progression beyond any formal training is a must for ICT to progress and develop in the education system today (NCREL, 2000).

The next section identifies how adult learners are defined and what characteristics they possess in order for their learning to be effective. As ICT can also greatly assist those who need to up-skill, as it has the potential to bring the learning to the learner and remove common barriers such as time and location (OECD, 2007).
2.6 Characteristics of Adult Learners

Depending on the author and country of origin there are many definitions of Adult learners. It is commonly defined by age. In North America, adult learners are defined as those aged twenty five and older, whereas in the UK the age is set to twenty one and older. In Ireland the age is suggested as being twenty three years and above.

In the late 1990s the Irish Government produced a Green Paper (Department of Education and Science, DES, 1998), and then published a White Paper in 2000 (DES, 2000) that has been responsible for shaping adult learning to date.

According to the White Paper 2000, it sees the role of adult education as contributing to people’s development as individuals, enabling them to fulfil their potential while participating in their own community and playing an active role in shaping society. To assist those who left school early and others to return to education with subsidised fees, the ‘Back to Education Initiative’ (BTEI) which was launched in 2002 along with ‘Vocational Training Opportunities Scheme’ (VTOS) have both made significant changes in the development of adult education (National Association of Adult Education, AONTAS, 2007).

The Department of Enterprise, Trade and Employment (DETE) has an employment and training strategy unit whose Key functions are to: systematically identify the skills needs of different sectors and advise on the actions needed to address them, develop forecasting techniques that will assist in anticipating future skills needs, advice on how to improve awareness among job seekers/school leavers of sectors where there are demands for skills, the qualifications required and how they can be obtained (DETE 2003).

The Department provides a National Training Fund which was established under the National Training Fund Act, 2000, as a dedicated fund to finance a range of schemes aimed at: increasing the skills of those in employment; providing training to those who wish to gain skills for the purposes of taking up employment; and to give information in relation to existing, or likely future, skills requirements in the economy. The Fund supports various training schemes operated by Foras Áiseanna
Saothair (FÁS), Enterprise Ireland, Industrial Development Authority (IDA) Ireland, Shannon Development, HEA, Engineers Ireland (IEI) and Skillnets. The fund is also designed to support and develop the area of lifelong learning (DETE, 2003).

According to Stephen Lieb, the field of adult learning was pioneered by Malcom Knowles. He identified the following characteristics of adult learners:

- Adults are **autonomous** and **self-directed**. They need to be free to direct themselves.
- Adults have accumulated a foundation of **life experiences** and **knowledge** that may include work-related activities, family responsibilities, and previous education.
- Adults are **goal-oriented**. Upon enrolling in a course, they usually know what goal they want to attain.
- Adults are **relevancy-oriented**. They must see a reason for learning something. Clear objectives and learning outcomes need to be set,
- Adults are **practical**, focusing on the aspects of a lesson most useful to them in their work (Knowles, 1990 p.31).

These characteristics suggest that effective adult learning should build on life experiences and should be structured to accommodate learning differences. Also, to motivate and sustain adult learning, the experience must be rewarding. Adults have little time to waste on learning that does not result in clear benefits. These characteristics of adult learners also suggest that effective applications of technology for adult learning need to be designed in ways that are appropriate to the age and life situations of adult learners (Lieb 1991). Bates (2000) found that an adult will need to be re-trained at least five times during their working lives, each time requiring an equivalent of three months full time learning.

Knox (1978) identifies that learning occurs throughout one’s life and that adults will learn both formally and informally. Formal learning occurs through education. This can be short, medium or long term and for example, could range from a couple of hours duration of a training course to full time education. Informal learning is gained within a social context and can be from many sources including peers, research and
experimentation. This type of learning occurs continually, as adults adapt to changing environments and demands (Knox, 1978).

One of the largest challenges for the educator can be the mix of abilities within a group (Daines et al., 1993). For adult learners, the level at which the teaching is pitched should be challenging, but not overly so, as this could dissuade the learner. Adult learners expect their facilitator to be knowledgeable, clear, enthusiastic, relevant, timely, professional, motivating, and dedicated in the subject areas they are teaching. They will expect their facilitator to create a learning environment where they feel comfortable and which is conducive to learning. They will tend to ask more in-depth questions than younger learners as their learning progresses (Daines et al., 1993; Thoms, 2002).

Lieb suggested six factors for adult learning motivation:

- Social relationships: to make new friends, to meet a need for associations and friendships.
- External expectations: to comply with instructions from someone else; to fulfil the expectations or recommendations of someone with formal authority.
- Social welfare: to improve ability to serve mankind, prepare for service to the community, and improve ability to participate in community work.
- Personal advancement: to achieve higher status in a job, secure professional advancement, and stay abreast of competitors.
- Escape/Stimulation: to relieve boredom, provide a break in the routine of home or work, and provide a contrast to other exacting details of life.
- Cognitive interest: to learn for the sake of learning, seek knowledge for its own sake, and to satisfy an inquiring mind.

(Lieb 1991.)

Adult learners for the purpose of this study will be considered as having completed Post-Primary study, is engaged in non-full time further education, and is aged at least twenty one or above. The apprentice learner is similar to the adult learner in his or her attitudes, expectations and requirements. They aspire to be self-directing, placing relevance on experience and occupation (Knowles, 1990).
2.7 Potential of ICT with Adult Learners

Imel cited Burge 1994; Cahoon 1998; Eastmond 1998; Field 1997 in her paper on Technology and adult learning that they all believed that Technology can enhance adult learning because it has the potential to increase flexibility, provide access to expertise, facilitate discussion among learners who cannot meet face to face, reduce feelings of isolation often experienced by non traditional learners, increase learner autonomy, and support and promote constructivist and collaborative learning (Imel, 1998).

The span of how ICT can be used is wide ranging. It can be used to deliver distance education courses for self-directed adult learners; to assist educators within the classroom with full time students and for online courses (Wang, 2005; Bates, 2000).

For an educator, access to a personal computer is the single most important factor enabling them to use ICT effectively in their professional practice (BECTA 2002). Likewise, for an adult learner it allows them to participate in education at a time and location of their choosing, and as a result facilitates the non-traditional learner that would not be able, or have the desire to attend a full-time course.

Hardware in terms of the computer is still only one aspect of ICT. Software is more important for the learner, as it will have the biggest impact upon the learning. Sabatini (2001) identified that the design of a multimedia product or learning system is directly related to the learning it can offer. Principles for effective media design come from theory, experience and observational research and the possibilities offered by the technology. The role of the designer when creating a multimedia product is to encompass these principles to arrive at a quality resource that will provide effective learning. It is critically important the designer be familiar with the domain of knowledge the desired software must encompass.

Ginsberg (1998) identifies that technology, when used correctly, has been proven to enhance adult learning. He recognizes that technology in itself may not be valuable,
however when used correctly in a sound educational manner and in a suitable environment with a well trained educator, then benefits gained are maximised.

In Ireland, Enterprise Ireland, Eurostat, OECD, Forfás, and the IDA are all playing their relevant roles in order to increase the level of skills, encourage job initiatives and encourage research for workers in Ireland, so that all will be able to secure a future within a changing environment. The major challenge at present is to build momentum for change and innovation at the level of the individual workplace (NWS, 2007).

In order to assess the impact of ICT on the teaching and learning of apprentice education a review of apprenticeships is necessary in order to understand how it differs from academic education. The next section identifies how apprentices are defined.

2.8 Apprenticeships

In traditional apprenticeship, the expert (master) shows the apprentice how to do a task, watches as the apprentice practices portions of the task, and then turns over more and more responsibility until the apprentice is proficient enough to accomplish the task independently (Baumgartner & Payr 1996). This apprenticeship was taught solely by the apprentice learning from his or her master. Nowadays the apprentice has the opportunity to learn through a combination of on-the-job training and off-the-job in specialised training centres and in Institutes of Technology.

Reigeluth (1999) defines apprenticeship as an:

“Experiential learning strategy in which the learner acquires knowledge and skills through direct participation in learning under immediate personal supervision in a situation that approximates the conditions under which the knowledge will be used”. (Reigeluth, 1999).

Apprenticeships in Ireland are taught using an agreed syllabus issued by FÁS. This syllabus is created and developed by FÁS in conjunction with the Department of Education and Science, Institutes of Technology, Employers and Unions and are reviewed and updated by representatives of these bodies. In other countries, like America, Australia New Zealand, Canada, Austria and the U.K. although an apprenticeship system may vary in duration and content, a correlation exists in terms
of syllabus content, teaching methods, objectives, time available and learning outcomes (FÁS 2003).

The apprenticeship system of training is based on an occupational analysis of the trade. It is used to establish the skills and knowledge that are required by the craft worker within the trade. FÁS (1998) describe four types of skills:

1. Core Skills: These are specific skills and knowledge that are required by all craft workers in the trade.
2. Specialist Skills: These skills apply to specialist sectors within the industry/trade.
3. Common Skills: These are common to other trades within a family or group of trades.
4. Personal Skills: These apply to all trades and include communication, customer relations, ability to work as a team member or independently, and problem solving etc.

Smith (2000) states that apprentices have a different learning style compared to university students. He explains that:

- Apprentices have a lower preference for organised coursework and explicit details on assignments and using listening as a learning mode.
- They prefer working with other apprentices and preferred learning by viewing illustrations, pictures or graphs.
- Apprentices’ favoured structured learning environments and learning through direct interaction with other learners and their instructors.
- They prefer hands-on experience, demonstrations and practice to lectures or ‘chalk and talk’.

(Smith 2000).

A very large range of abilities exists amongst apprentice students in Ireland. This is due in part to their educational level prior to entering an apprenticeship and partly due to their personal ability. A student may enter an apprenticeship with a minimum of
four D’s in their Junior Certificate and must be at least sixteen years of age in order to be registered on an approved apprenticeship. As there is no upper limit, students who have completed a leaving certificate or who already have a third level qualification can also be registered on the course.

There existed an absence of previous research in relation to computing skills and computing requirements within the apprentice system in Ireland. IT 2000 is a policy framework for the integration of ICT in first and second-level schools. The core objective of the policy was to put in place an infrastructure to ensure that: ‘pupils in every school should have opportunities to achieve computer literacy and to equip themselves for participation in the information society; support is given to teachers to develop and renew professional skills, which will enable them to utilise ICT as part of the learning environment of the school’ (DES 1997).

In the case of apprentices one relevant report was produced as part of the National Framework on Progression Routes for Crafts-persons. The main purpose of this report which was conducted in apprentice training institutes of technology around the country was to examine the perceptions of the students in relation to further education and progression, and it used a population of 977 apprentice students from various trade areas. It quantified that 94% of apprentices were likely to progress from an apprenticeship to further education, and examined the most likely barriers each would face (Framework for progression of craftsperson’s 2008). In the UK, training after full-time education was happening for 20% of people in 2006, and 42% had had training within the last four years (NIACE, 2006).

Although evidence shows that apprentice learning in America, Australia, New Zealand, Canada, Austria and the U.K run apprenticeship programmes similar to the programme in Ireland. Of these countries the only real evidence of the use of digital media was in Canada where they used a virtual campus and in Australia where they used a flexible delivery apprentice training. These systems used video conferencing and web broadcast to convey their lecture whether the students are on or off the campus. Although these lectures would be interactive they would not be suitable for
the practical experience the students require doing apprenticeships. The apprentice system in Ireland requires the students to attend all lectures on campus.

In order to understand the learning process in more detail an examination of instructional design is necessary. The next section identifies different learning theories and examines their strengths and weaknesses in order optimise their use.

2.9 Instructional Design

Instruction is anything that can be done to help someone learn and instructional design is anything that can offer guidance for improving the quality of that help (Reigeluth, 1997). Many definitions exist for instructional design - all of them are an expression of underlying philosophies and views of what is involved in the learning process. Distinguishing the underlying philosophy of learning can help instructors and designers select the design model most similar with their education philosophies (Siemens, 2002).

Instructional design is a system or process of organizing learning resources to ensure learners achieve established learning outcomes. From a designer’s perspective, various models can be followed in the instructional design process. It is important for the instructional designer to understand the strengths and weaknesses of each learning theory to optimise their use in the appropriate instructional design strategy (Alessi and Trollip, 2001). The following section examines a number of learning theories that have influenced instructional design.

2.9.1 Theories of Learning

Learning could be described as the process which changes an individual’s knowledge, skills, attitudes and values, the changes that occur would then last for a period of time i.e. the person has learners (Daines et al, 1993). Driscoll (1994) suggested that many learning theories do share some basic assumptions about learning:

- Learning is a persisting change in human performance or performance potential.
To be considered learning, a change in performance must come about as a result of the learner’s interaction with the environment. Learning requires experience. How these experiences are presumed to bring about learning distinguishes different learning theories.

Of specific interest are the works of the behaviourist, cognitivist and constructivist theorists whose works and ideologies have shaped teaching and learning in recent history and today provide a theoretical grounds for the successful integration of digital technology into learning. To this end these theories and associated issues will now be investigated.

2.9.1.1 Behaviourism
The behaviourist model of learning focuses on observable indicators that learning is actually taking place. Behaviourists believe that the environment shapes behaviour, the student will adapt to the environment. Essentially, it focuses on a new behavioural pattern being repeated until it becomes automatic. Behaviourist theory emerges in the form of operant conditioning using reinforcement (Skinner, 1968). This practice is reflected in the classroom by the use of gold stars, extra time on the computers etc. Skinner believed that more complex learning could be achieved by this process of contingencies and reinforcement "through successive stages in the shaping process, the contingencies of reinforcement are being changed progressively in the direction of the required behaviour" (Skinner, 1968, p.10).

A criticism of Behaviourism is that it is one-dimensional and does not account for all kinds of learning since it disregards the activities of the mind. The behaviourist teaching approach is that the teacher is seen as the source of all wisdom, and that no provision is made to connect the learning to the learner’s prior experience, understanding and beliefs (Forrester 2001). This ‘drill and practice’ approach is still widespread in modern education; for example as in a structured lecture based learning environment. Mihalca (2005) identified that educational software has been strongly influenced by this approach up to the current day, and the time has come to change this or at least question it.
In applying the behaviourist tradition to the use of ICT in education, the material to be learned is broken down into a sequence of small, well defined steps, through which the learner must progress. The computer acts in the role of tutor, directing the learner, accepting input and offering feedback.

2.9.1.2 Cognitivism

Cognitivism grew as a response to behaviourism and became the dominant learning theory during the 1970s. As opposed to behaviourism, knowledge acquisition is measured by what learners know, not necessarily what they do. The idea of cognitivism is that learning is a conscious, rational process. People learn by making models, maps and frameworks in their mind. Cognitivism focuses on the processes of the mind through memory, motivation, reflection and thinking (Alessi and Trollip 2001). The learning process is the method by which these symbolic representations are committed to short and eventually long-term memory. In addition, knowledge is viewed as being external of the learner, and similar to behaviourism, knowledge is given and is absolute (Alessi and Trolllip, 2001).

An underlying criticism of cognitivism is as with behaviourism, the learner knows a certain way to do things based upon specific cues, but that way may not be the best, most efficient or safest way to do something in the advent of different environmental stresses or scenarios (Jonassen, 1994).

2.9.1.3 Constructivism

Constructivism is often misconstrued as a learning theory that compels students to "reinvent the wheel." In fact, constructivism taps into and triggers the student's innate curiosity about the world and how things work. Students do not reinvent the wheel but, rather, attempt to understand how it turns, how it functions. (Concept to Classroom, 2004).

Constructivist learning is based on students' active participation in problem-solving and critical thinking regarding a learning activity, which they find relevant and engaging. They are "constructing" their own knowledge by testing ideas and approaches based on their prior knowledge and experience, applying these to a new
situation, and integrating the new knowledge gained with pre-existing intellectual constructs (Moursund D., 2004).

The basic distinction in constructivism is that while behaviourists view knowledge as something that happens in response to external factors, and cognitivists view knowledge as abstract symbolic representations inside the learner's head, constructivists view knowledge as constructed internally by each individual, “all humans have the ability to construct knowledge in their own minds through a process of discovery and problem-solving” (Forrester 2001).

2.9.2 Conceptual Models of Instructional Design

Instructional Design (ID) Models are the systematic guidelines instructional designers follow in order to create a workshop, a course, a curriculum, an instructional program, or a training session. Instructional design aims for a learner-centered rather than the traditional teacher-centered approach to instruction, so that effective learning can take place. This means that every component of the instruction is governed by the learning outcomes, which have been determined after a detailed analysis of the learners’ needs (Reigeluth, 1997).

A wide selection of models exists, each having its own particular strengths or weaknesses. The most appropriate model is the one which best guides the creation of media to support learning of an already existing course which was dealing with teaching computer graphics. A number of models were researched for suitability and these are briefly listed here:

Gagne’s Instructional Design Model

Robert Gagne is considered to be one of the leading researcher and contributor to the systematic approach of instructional design and training. Gagne suggested that instruction should be designed that allows learners to acquire subordinate skills before they attempt to acquire superordinate ones (Reiser 2001). Gagne's nine events of learning, serve well as a framework for the successful development of educational multimedia programmes (Hannafin et al. 1989).
The Alessi and Trollip Instructional Design Model

The Alessi and Trollip (2001) model of Instructional Design provides a standard-based but flexible approach, which is based on a cycle of drafting, evaluating and revising until the project works.

The ADDIE Model

ADDIE stands for Analysis, Design, Development, Implementation, and Evaluation of learning materials and activities for instructional design. It is a general purpose model, most useful for creating instructional products, but also applicable for program design. The ADDIE Model is an iterative instructional design process, where the results of the formative evaluation of each phase may lead the instructional designer back to any previous phase. The end product of one phase is the starting product of the next phase (McGriff, 2000).

The Dick and Cary Model

The Walter Dick and Lou Carey model prescribes a methodology for designing instruction based on a reductionist model of breaking instruction down into smaller components. Instruction is specifically targeted on the skills and knowledge to be taught and supplies the appropriate conditions for the learning of these outcomes (McGriff, 2000).

Each of the models investigated has its own merits and demerits. Some researchers argue that instructional design is a linearly sequenced process whereas others take a more holistic approach and acknowledge interdependencies and concurrency of all activities of design. A good linear model will ensure that developed instruction material will be relevant for the audience (Smith, 1999).

The Dick and Carey model may not best serve the required function for this research as it can be inflexible (Clark, 2004). Minimalism seems like an effective model to use when teaching computer applications, with experienced adult learners. It may, however, be difficult to implement in a reasonable to large sized class situation, especially where not all learners are fully committed and this model may not facilitate self-paced learning to a large degree (Carroll, 2007). The ADDIE model, although
very suitable for use with technology like computer graphics can be too constraining and is slow to implement with adult learners from diverse backgrounds (Kruse, 2000).

After consideration of all these models it was concluded to focus on the Alessi and Trollip model. This model is good with computer graphics and is flexible enough to incorporate newer technologies such as video (Ryder, 2008).

2.9.2.1 The Alessi and Trollip Instructional Design Model

This is a clearly defined model and is initially split into three Phases. These are Planning, Design and Development. In addition to this, three attributes exist which are running concurrently and must be adhered to at all times. The three attributes are: Standards, Ongoing Evaluation and Project Management.

Each phase of this model can be subdivided and adapted to meet the needs of the project in question. The following are some of the areas that Alessi and Trollip suggest when setting out each stage of the project (Alessi and Trollip 2001).
2.10 Conclusion

Government initiatives to integrate ICT into the existing curriculum are taking place all around the world, individual countries are creating and implementing their own National Plans for Learning as shown in Ireland. Whether ICT succeeds or fails in education depends on teachers’ skills and their priorities for future development. Without the right kind of teacher guidance, ICT is of little use in education. Providing technical skills training to teachers in the use of technology is not enough (BECTA, 2003). Governments need to develop effective pedagogy around ICT and they need to establish what will encourage teachers to adopt ICT.

The teacher continues to be a critical contributor to success in classroom learning including learning with ICT. The teacher’s own familiarity with ICT and confidence
and competence levels in its use is a key determinant of the effective use of ICT in the classroom. There is a strong motivational link between the teachers’ perception of personal value in using ICT and his/her use of ICT in classroom pedagogy. Access to ongoing and appropriate ICT professional development is a prerequisite for all teachers if they are to improve their confidence and competence in using ICT to meet the needs of all their students. (N.C.C.A., 2004).

Integrating ICT into the school curriculum in a meaningful and creative way is a challenge for all schools. Comprehensive ICT integration takes time and necessitates appropriate school planning in order for the process to take place in a truly co-ordinated and developmental way. ICT integration is a never-ending journey rather than a once-off activity (ICT Planning, 2002).

The use of ICT with Apprentice students who are adult learners involves many complex and inter-related issues for the learner: the cognitive ability of the learner, their familiarity with technology, their prior experience, attitudes, perspectives and expectations of the learning and technology.

The design of any resource is very important, and in particular its suitability to the target audience. An informed designer in both areas of human computer interaction and pedagogy can hope for better results than the less skilled designers who are trained in just one of these areas. In addition, detailed knowledge of the target group will serve to improve any resource and thus enhance the learning further.
Chapter 3
Methodology

3.1 Introduction
The primary aim of this research is to discover whether the learning of a topic in Carpentry and Joinery craft theory could be improved for apprentice students by using a tool of digital media as a learning resource. This chapter outlines how staff and students were surveyed. Various research methodologies and data collection instruments appropriate for research in education are discussed and the ones considered most effective are selected and implemented. This chapter also deals with the importance of validity and reliability and the use of triangulation. Ethical issues attached to conducting research are also addressed as is the limitations of the research.

3.2 Research Methodology
Bell (2005) stated that before considering the various stages of planning and conducting investigations it might be helpful to consider the main features of certain well-established styles of research. Cohen et al. (2005) identify eight main styles of educational research. These are as follows:

- Historical Research
- Naturalistic Research
- Surveys
- Case Studies
- Cross-sectional studies
- Experiments
- Action Research
- Reviews

Some styles will be more suitable than others for any given study although most employ both qualitative and quantitative research methods. It is the responsibility of the researcher to assess which style is the most appropriate to the particular task in
hand. The researcher must remain conscious of the time available in which to complete the study. After identifying the ‘fitness for purpose’ of each research method for this study, it was identified that a case study approach best suited the researcher’s purpose.

Case studies focus on one or a very limited number of instances or examples of a particular phenomenon in order to construct an in-depth account of what happens or happened during that instance (Yin 1984). The emphasis is on depth rather than breadth of study. But there is also an emphasis on studying things as they naturally occur rather than manipulating the situation by introducing specific changes and controlling certain variables, as in an experiment (Cohen et al, 2000). They are good to use in a dynamic situation as they can penetrate interaction between events, human relationships, perception and other factors in a unique instance. Within the case study method a variety of materials may be used, including questionnaires, interviews, observation records and tests (Cohen et al, 2005). Information gained from a case study will not always be able to be analysed in a numerical fashion, and some interpretation of the findings may be required.

Yin (1994) suggested that the researcher must possess or acquire the following skills: the ability to ask good questions and to interpret the responses, be a good listener, be adaptive and flexible so as to react to various situations, have a firm grasp of issues being studied, and be unbiased by preconceived notions.

### 3.3 Research Questions

The objective of this research is to determine through all the data collected whether ICT/digital media improves the learning of apprentice students. The research was designed to address the following areas of enquiry:

- What effect the learning resource software has in relation to the enhancement of learning for the students?
- What change occurred in the learning for each individual learner?
- Was ICT/digital media effective as a learning tool and what is the educational potential of computers for apprentice students?
What professional development educators require and what level of commitment do they have, for integrating ICT/digital media in education?

To address the research questions it was felt appropriate to gather information from students and staff of an Institute of Technology who teach apprentice carpentry and joinery students. The primary objective was to generate data from both quantitative and qualitative research methods. The methods used are discussed later in the research tools section.

3.4 Background to study

There are a total of one hundred and sixty students of both phase four and phase six Carpentry and Joinery apprentices attending the Institute. The apprentices are divided alphabetically into five smaller groups of thirty-two which make up each class size. Each class is assigned letters A-B, C-D etc. These classes are all taught together except for computer classes where they are divided again alphabetically into two groups of sixteen known as group A or B to accommodate for the size of the computer lab.

The Phase four Apprentice Carpentry and Joinery students are in the third year of a four year Apprenticeship program. Their educational background varies since minimum entry onto an apprenticeship is the Junior Certificate. Some students will have completed their Leaving Certificate, while some others will have completed a third level qualification. These students have successfully completed twenty weeks training at a FÁS training centre and their on-the-job training with their employer. All these students can be considered as adult learners. Their age ranged between twenty and thirty years and all were of male gender.

The phase four apprentice class A-B has thirty two students who voluntarily agreed to participate in this study. Test group “A” which was made up of sixteen students used the Digital Media resource in addition to traditional teaching methods and control group “B” who were taught using traditional teaching methods only.
A number of staff from the Department of Applied Technology in the institute were involved in the study for the purpose of reviewing the software and participating in informal interviews, focus group and questionnaire. The reasons for choosing staff from the Department of Applied Technology were that they are familiar with these students’ abilities and perceptions. Also, seven of these staff have been awarded with a Postgraduate Diploma in Digital Media and Development in Education and are knowledgeable in the software and the craft theory being taught.

The setting was the computer lab in the Department of Engineering Technology in the institute. This lab was chosen as all apprentice students are familiar and thus should be at ease with the setting, as this is where they have their scheduled computer classes.

3.5 Research Tools

Each of the data collection instruments used during the case study has a specific role within the study. Each serves the function to develop the study further, but differs in how this is implemented, a discussion of each instrument will now take place.

3.5.1 Questionnaires

Questionnaires are a simple cost effective data collection tool, where a large volume of data can be collected on wide ranging topics in a very short period of time. The practical advantages of questionnaires are that they are easy to administer, allow respondents time to consider answers and impose uniformity by asking the same questions (Cohen et al., 2005).

The main benefits to questionnaires are that the responses are anonymous giving a greater potential to receive honest answers. The researcher has little or no influence on the outcome and everyone surveyed answers the same set of questions. There are also drawbacks with questionnaires for example, the students completing the questionnaire usually cannot ask for clarification of questions. As the questionnaires were anonymous follow up questions to comments or answers to questions was limited (Cohen et al., 2005).
A well designed questionnaire is critical to ensure that the desired information is obtained. Cohen and Manion (1994) suggest that the clarity of wording and simplicity of design is essential for a successful questionnaire. The layout and sequence used for the questionnaires avoided the use of unnecessary headings and clutter. It used simple concise language and avoided leading questions. Bell stated that all data gathering instruments should be piloted to test how long it takes and that the questions and instructions are clear (Bell, 2005).

The pre-training questionnaire was designed in order to gain knowledge of each student’s educational background and to determine each student’s existing computing ability. It also researched the student’s perception of the possible worth of computers involved in their education now and in the future. Input from colleagues in relation to design and content was also sought with identified changes being made prior to use. Please refer to appendix B for a copy of pre-training questionnaire.

The post-training questionnaire was designed to establish what, if any, was the effect of the software in relation to the enhancement of learning for these students. It also investigated the change which occurred in learning for each student, and the educational potential of computers for each individual. The effectiveness of the digital media was also researched. It was piloted by two colleagues as suggested by Bell (2005). Opinions were sought in the form of comments in relation to the questionnaire design and what they felt was relevant and what was missing that was relevant. After piloting, a number of questions were adjusted to remove any uncertainty. Adjustment to layout and design was also essential. Please refer to appendix D for a copy of post-training questionnaire.

Both questionnaires were distributed to all participants. The pre-training one was given after the first discussion with the students about the study. The post-training questionnaire was distributed manually on week six upon completion of the students midterm exam. Anonymity of each participant was assured in an appeal for truthful completion of the questionnaires. The researcher was present for distributing and collecting the questionnaires and sufficient time was given to complete both questionnaires. Continuity between the pre
and post-training questionnaires was essential so that the magnitude of any effect could be gauged. Thus, some areas of the post-training questionnaire are directly comparable with that of the pre-training questionnaire.

As the questionnaire was designed to gain quite a varied amount of data, with some questions being open ended, while others used a Likert scale to gauge the strength of a response. Data was manually analysed from the questionnaires as some open-ended questions were used. This was also done in an attempt to fully understand the results in the context of the case study approach used. Details of where this occurred are referred to in the findings and discussion chapters.

### 3.5.2 Focus Groups

Focus groups are used to gain spontaneous reactions and ideas, and allow observation of group dynamics and organizational issues. Each group is run by a modulator who has the function to keep the group focused and running smoothly. It is all too easy to let one or two individuals take control of the group and this effectively stems the flow of useful information from the group (Cohen and Manion, 1994). Kitzinter (1995) recommends that a good modulator is required when this occurs with the modulator requiring strong leadership and communications skills to ensure that all voices and opinions are heard. The modulator did not structure the group formally and had to provide some pointers to keep the group on-track during the meetings. The pointers that were provided were very general headings which were introduced only when necessary. Please refer to appendix F for a copy of comments during focus group.

Focus groups require several representative users and the members for this group were self-selected. Cohen et al. (2005) recommend that any group be formed from people with diverse opinions such as staff and students, as opposed to selecting only one group to participate. In light of this, the focus group for this study consisted of four students and two members of staff.

The focus groups discussed the use and effectiveness of digital media, and investigated any issues which arose during the course. These issues could be of a technical nature or there could be discussions on how best to implement the software.
The group also discussed the training media used under a number of headings such as technical content, design, suitability, interaction, possible improvements and overall effectiveness. It was intended that the information would prove to be useful in association with questionnaire data and interview notes in order to validate the findings in relation to digital media. The post-testing questionnaire was, for the large part, created by the group.

### 3.5.3 Interviews

Tuckman (1972) cited in Cohen et al (2007) claims interviews:

> ‘provides access to what is inside a person’s head, it makes it possible to measure what a person knows (knowledge or information), what a person likes or dislikes (values and preferences), and what a person thinks (attitudes and beliefs)’. (Cohen et al 2007, p.351)

The interviews were conducted with two willing participants who volunteered to be interviewed. One of the two interviewees was from the control group and the other from the test group. It was envisaged that each interview would last for in the region of twenty minutes. A voice recorder was available for the interviews. Unfortunately both interviewees declined to being recorded as they identified that this would serve to heighten their anxieties during the process. This was unfortunate as the researcher did not have access to the exact words spoken by the interviewees, and although both candidates permitted note-taking, this tended to disturb the natural flow of the interview.

The interviews were designed to be semi-structured, in that the interviewer had a list of main topics to be included for discussion. This list was not comprehensive and the interview could deviate from this whenever valuable information was gained. It was felt that this approach would at least ensure that all basic areas were investigated, and that the interview would stay within the zone that was required by the interviewer. The interviews were completed in a room that the students were familiar with in order to place them at ease. Please refer to appendix G for a copy of interview questions and comments.
3.5.4 Observation

This is a valuable tool as it allows the researcher to understand what is happening in practice. It is involved in the study of ‘live situations’ as opposed to perception based data and thus the information yielded can often be unexpected.

Observation is very important during case study research. Events and instances should be allowed to speak for themselves where possible, as opposed to being interpreted, evaluated or judged by the researcher. In order to effectively capture the close-up reality of a situation, the researcher should avoid selective reporting, this is where the researcher selects mostly material which will support a pre-determined desired outcome. An anecdotal style should also be avoided, where the research focuses on unimportant detail and fails to see the greater overall picture, as should the dangerous practice of drawing high level conclusions from low level data (Cohen et al., 2001).

Patton (1990) cited in Cohen et al. (2000) suggests that observational data allows the researcher to understand and connect with the situation being described. Direct observation allows interaction amongst students, and between students and the facilitator to be recorded so that it may be used as an effective gauge to see and understand what is happening in the classroom.

An observation schedule was designed in order to record the frequency of interaction for the students while using the digital training media. Please refer to appendix H for a copy of observation comments.

3.5.5 Domain Referenced Test


Both the test and control groups were given a domain reference test at the end of the study. It was used to examine whether the digital media affected the grades achieved by each group of students.
Group A was taught using the software following initial guidance on how to get started and navigate through the CD, which was given via a data projector for a brief period. They were then allowed to individually explore the CD. Group B were taught using the traditional method of a Powerpoint Presentation and handout and discussions took place during the lesson.

After the lessons both groups were advised to revise for a short multiple-choice test on the topic that would be carried out the following week. This was done to evaluate whether the software improved the educational intake and information retention abilities of group A. In the interest of fairness the multiple-choice test was given in written form to both groups as group B would not be as familiar with the software and also their final exam is in written form. The questions were spread across the lesson so a broad understanding of the lesson was required to be successful. Please refer to appendix I for a copy of interview reference test.

When one carries out a study ultimately results and data will be gathered. Determining the impact of the results is dependent upon two concepts: validity and reliability. The next section describes both and explains how they were used.

3.6 Validity and Reliability of the Research

Validity refers to the effectiveness of a research tool to achieve the objective for which it was designed. This is an important aim to achieve in both qualitative and quantitative research and is the primary responsibility of every good researcher. Cohen et al. (2000) suggest that ‘in quantitative data validity might be improved through careful sampling, appropriate instrumentation and appropriate statistical treatments of the data’ where ‘in qualitative data validity might be addressed through the honesty, depth, richness and scope of the data achieved, the participants approached, the extent of triangulation and the objectivity of the researcher.’ During the data collection phase it is important to try to minimize the “Hawthorne effect” which is, participants trying harder or behaving differently because they know they are part of a study. Validity for this study should be achieved by cross-referencing several sources of reliable data.
Cohen et al. (2000) define reliability as a synonym for consistency and reliability over time, over instruments and over groups of respondents. The prerequisite for reliable research is that it is carried out on a similar group of respondents and in a similar context, and for this study these prerequisite were followed.

3.7 Triangulation

Cohen et al. (2000) define triangulation as:

The use of two or more methods of data collection in the study of some aspect of human behaviour (Cohen et al. 2000, p.112).

The process of triangulation is often used in research to ensure that a thorough investigation has been carried out. It involves multiple sources of data collection to support and validate findings. Lin (1976) cited in Cohen et al. (2007) stated that reliance on only one method may give a biased or distorted outcome to the study and encourages the use of more than one method to give a greater validity to the findings. Within this study carried out by the researcher, the triangulation principles were used and more than one data collection method was triangulated in order to validate the results of the study.

3.8 Limitations of the Research

Arranging meetings with colleagues and organising the focus group proved to be a major challenge. It was difficult to fix a time that all the willing participants that were able to attend the focus group. This researcher is involved in full-teaching so contact with colleagues could only be done at break time which was not ideal. The time spent testing the students was difficult to organise because of availability of the computer lab and also the apprentice course is very short (ten weeks) and is very intense with exams on week five and week ten of their course.

It was felt that the educational background, prior life experience and attitudes of the participants in relation to the computer also could have an effect on the data from the study. The pre-training questionnaire was designed to attempt to establish existing student educational background and previous computer knowledge. It was also
designed so that correlations could be drawn between the pre-training and post-training questionnaires.

For this study no candidate initially volunteered for the interview or the focus group. The researcher then explained in full how the interview and focus group would operate and eventually volunteers came forward after a lot of convincing and more reassurances.

It was very difficult to be an effective researcher, moderator, interviewer, and a facilitator to some while being a teacher to others. Lack of expertise in some of these areas will also have had an impact upon the results obtained.

3.9 Ethical Issues

Intrusion into lives of the participants in terms of time taken to complete the test, questionnaire, focus group and interviews had to be given careful consideration. Issues in relation to the perceived threat of the questions, the sensitivity of the questions and the possible invasion of the respondents’ privacy were addressed.

Consent was obtained from all participants in relation to the study. The prospective research participants were fully informed about the procedures and anonymity was guarantee at all times throughout the study. Also control group B was given a copy of the software on completion of the study in order to service their rights to equal access.

3.10 Conclusion

In conclusion, it was the aim of the research to obtain a fairly representative range of responses to fulfill the objectives of the study and to provide answers to key questions.

The research method and the tools used to conduct the study were selected after carefully studying all aspects of research methodology deemed suitable. The research tools used were effective in achieving their intended outcomes and realised a considerable amount of data both qualitative and quantitative. The findings to emerge from an analysis of this data are outlined in the next chapter.
Chapter 4
Findings

4.1 Introduction
This chapter reports on the research findings of the study. The aim of the research carried out was to examine whether a tool of digital media works effectively as an assistive learning resource for a craft theory topic in Carpentry and Joinery. It also examines if the learning resource improves the teaching and learning experience for both staff and students.

The findings are based on the results of the questionnaires, focus group, domain reference test and interviews. These are layout separately as to answer the research questions raised in the methodology chapter.

A total of thirty two apprentice students were involved in the study. Sixteen of these used the learning resource CD following some initial guidelines and were also able to avail of the traditional teaching method, and the other sixteen were taught using traditional teaching method alone. All students completed pre and post-training questionnaires, thus a complete data set was achieved. The most significant findings to emerge from the research are contained in the sections which follow. A copy of the findings is available in the appendix section.

A number of staff from the Department of Applied Technology in the institute were involved in the study. They are familiar with these students’ abilities and perceptions. Also, some of the staff is knowledgeable in the software and the craft theory being taught. The data gathered for the staff findings was from informal interviews, focus group and questionnaire. A copy of the findings is available in the appendix section. The most significant findings to emerge from the research are contained in the sections which follow.

4.2 Findings presented by research questions
4.2.1 What effect the learning resource software has in relation to the enhancement of learning for apprentice students?

4.2.1.1 Questionnaire findings

Students were queried as to the benefits of using the digital media compared to being taught using the traditional methods of learning. 75% of the test group felt that the software program had enhanced their learning and overall learning experience.

93.75% of the test group felt that it did not impede their learning in any way and almost 63% of the test group indicated the availability of craft theory information on a CD as being the key to using the program.

68.75% of the test group found the ease of using the CD compared to notes was also a major factor for using the learning resource and they enjoyed the accompanying graphics and sound compared to photocopied notes with black and white pictures.

87.5% of the test group liked the element of choice for learning by using the CD and being taught during the traditional method of teaching. 12.5% of the students felt that

Figure 4.1 Different methods of using the software
learning with programs like this could replace face-to-face teaching while 25% felt it could be used as a standalone program and 62.5% felt that it would improve learning as an enhancement to the traditional method of teaching.

4.2.1.2 Focus group findings
During the discussion on whether the software impeded on the students learning in any way one student commented that due to their lack of knowledge of computers they felt a bit stressed and unsure using the software.

Most of the students at the focus group believed that the availability of craft theory information outside of class was an excellent feature, as one student stated “it has given me access to notes outside of college” and queried “where could I get more notes like this”.

When the students were asked was there any reason for rejecting the software program and not using it at all. The most common answer given for rejection of the program was the inability to ask a question of the computer.

Most students indicated that they found the program very easy to understand and would be most beneficial when studying for exams. Some of the comments from the students “When it’s hard to understand what a teacher is explaining you can read these explanations again and again”. “I would use this program to help me when I am studying for my exams”. “It’s easier to learn if you are face-to-face with the teacher. But if you needed help at home I suppose it would help”.

4.2.1.3 Interview findings
When asked if the ease of using the CD compared to notes was also a major factor for using the learning resource and did they enjoyed the accompanying graphics and sound compared to photocopied notes with black and white pictures. Interviewee one stated that “being able to see a picture in colour made it easier to understand compared to seeing the same black and white picture in the notes”.

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Interviewee one was asked could he think of any reason for not using the software. He replied that he really liked using the software and believed it would be better if other staff started using something like it.

4.2.2 What change occurred in the learning for each individual learner?

4.2.2.1 Questionnaire findings

In response to the question “If there were more topics in craft theory available on CD do you believe it would improve your learning?” 75% agreed and said it would. 93.75% said that using the software program was enjoyable.

87.5% of the students felt they had learned something new from the software compared to the traditional method of teaching.

68.75% of the test group felt that the learning resource had given them a deeper level of understanding of the topic before being taught using the traditional method.

75% of all the students found the first five weeks of craft theory difficult and felt it was hard to keep pace with the required learning. Yet 25% of the test students found the chosen topic of craft theory difficult, while 50% of the control group found the topic difficult.

In the questionnaire 81.25% of students agreed that if they got stuck and needed assistance while using the software, then all identified ‘Ask the Teacher’ as the most obvious course of action to take.

4.2.2.2 Focus group findings

In response to the question “If there were more topics in craft theory available on CD do you believe it would improve your learning?” One student commented that he found, the volume of information he had to take in during the first few weeks was a bit excessive, but that the CD helped him a bit in that he did not have to remember it all at once.
When asked about their experience during the first five weeks of craft theory most found it difficult and felt it was hard to keep pace with the required learning. One student in the focus group identified that “I nearly gave up on week two” and “I needed a good bit of help during the first few weeks.

4.2.2.3 Interview findings
The software gave the students a prior knowledge which was an advantage before being taught by the traditional method. Interviewee one stated that “I knew exactly what you were talking about during class and any question I had after using the CD, you cleared them up”.

4.2.2.4 Observations findings
It was observed that the students who used the software program were more involved in the class discussion and had more questions and points to make on the topic during the traditional method of teaching than the students who were not.

It was observed that individual students from both groups learned via different methods. Often the facilitator needed to explain some information in a different way when a student could not understand an original explanation.

4.2.2.5 Domain reference test findings
The difference in the results of the domain referenced test was only 7.5%, the test group with an average result of 76% and the control group with an average result of 68.5%.

4.2.3 Was ICT/digital media effective as a learning tool and what is the educational potential of computers for apprentice students?

4.2.3.1 Questionnaire findings
In both the pre and post questionnaire 87.5% of all students identified that using computers was relevant to them, but only one of the students had ever used computers to learn a topic from a subject on a course they had completed.

The amount of prior computer training varied significantly between students, although all had completed at least some prior computer training. 91% of students identified that they had gained most of their computer training while attending post primary school. One student had received the majority of his computer training to date from a friend.

![Ability to use computers graph](image)

**Figure 4.2 Apprentice ability to use computers**

In the pre-questionnaire 44% of the students considered their ability to use computers to be good or excellent. 43.5% rate their ability as fair while 12.5% stated that they would rate their ability to use a computer as poor.

All students in the study could see at least some relevance of computer training, even if they were only referring to the use of the Internet. Of the 56% of students who had completed training in File Management, only 50% of students could see the value of being able to manage files and only 56% saw this skill as being relevant. These remaining students (44%) could not see the relevance of this as they stated that they have no possible need for it.
When the students were asked whether they felt using computers would benefit their learning. 81.25% of students agreed that computers would improve their learning whether using the internet or a CD-ROM.

![Graph showing CD usage](image1)

Figure 4.3 Use of CD after the test was complete

All members of the test group used the CD provided while in class, but it was used infrequently or never by these students outside of class contact time. 50% view once when studying for the exam. The two main reasons identified for this were lack of available time and no real necessity for the student to do so.

![Graph showing software layout](image2)

Figure 4.4 General layout of the software
For the software, the test group evaluated the screen design. The general layout was identified as being good by 43.75%, fair by and 25% and excellent by the remaining 31.25% of students. Similar percentages applied for the colour schemes, colour consistency and for the type and amount of text used. Navigation was said to be good to excellent by all students, and the sitemap was not used by 43.75% of students. The ability to navigate to any point at any time was enjoyed by all students, but 18.75% of students did not visit all the pages in the programme.

The software did not always provide enough interaction for 25% of students, with one of the test group saying that interaction was below their desired level. Although the software was relevant to the learning and simple to use, it was not set at a challenging enough level for 18.75% of students as the course progressed.

At least one software self test exercise was completed by all students. Opinion was divided more of less evenly on the usefulness of the scoring provided here. This was incorporated by the designer in order to increase interaction, as was recommended by peers at the outset of the project. 62.5% of students completed all three self-tests.

**4.2.3.2 Focus group findings**

In the focus group all the students agreed that the software was pitched at a correct educational level for the students, with all finding it relevant and good to use. Two students identified that they did not use the software much after the first time, except when they used it for revising for their exam.

The students were asked what their thought where of the learning resource software as a learning tool. Their replies were as follows: the ability to play, pause and re-play all video files was liked by all students.

Design was seen as pleasant and consistent with no student having navigational issues; a view supported by the post-training questionnaire. “The CD was great at explaining the process and the video really helped”.
The graphics and sound used for the CD were of a high quality and proved to be relevant and controllable by all students during the research. Technical content of the CD was identified as being approximately correct by all group members. “The CD was very useful for the first few weeks, especially when you miss something as you can go back and re-play it”.

4.2.3.3 Interview findings
When asked would computers improve their learning whether using the internet or a CD-ROM. Interviewee one said “I didn’t know that I could learn from computers in this way and I will be more interested in computers from now on”.

4.2.3.4 Observations findings
From the observations the test group seemed to be learning more rapidly than the control group. Yet in the results from of the domain reference test, suggested that the amount the two groups had learned was quite similar but it had occurred in significantly different ways for both groups.

4.2.4 What professional development educators require and what level of commitment do they have, for integrating ICT/digital media in education?

4.2.4.1 Questionnaire findings
The staff were asked if they felt the learning resource enhanced the students learning experience. Only 60% felt it would with the other 40% feeling either it would not or were unsure whether it would or would not.

The staff were asked about the fact that if students could access their notes and associated course material on a CD from outside the institute and more importantly outside of class would affect the attendance at lectures. There was a sixty-forty split in favour that it would not affect class attendances in the future.
When asked if they would use the resource for carrying out course assessments 55% believed it may guarantee that the students would use the program and it may be a good way to assess whether the students were learning from it.

All staff involved in the study agreed that ICT may be beneficial to the education of apprentice students. When asked would they consider using a software learning resource instead of their traditional method of teaching. All replied no, but most would consider using it to supplement their current methods of teaching.

50% believed that the time and effort required to put a topic together on a CD was too great. 20% believed that their current subject material would not be suitable for that learning environment while a similar number of staff were unsure about the educational value of the learning resource for the students.

40% of lecturers however did also believe more training was required on the use and implementation of ICT in the classroom to ensure they got the most out of the system.

The staff were asked if they felt that a learning resource like this would increase or decrease their workload. They all believed that their workload would increase dramatically initially but once the system would be up and running it probably would reduce the workload, especially with the weaker students.

More than half (55%) the lecturers considered their ability to use computers to be good or excellent. 34% rate their ability as fair while 11% stated that they would rate their ability to use a computer as poor.

45% of lecturers stated that a lot or all their knowledge and skill in the use of ICT had been self-taught. A further 40% indicated that their knowledge and skill is somewhat the result of their own effort. The remaining 15% have developed little or none of their knowledge and skill in using ICT through their own efficacy.

When asked about the training they have received in the use of ICT, 10% stated that they have never received any ICT training. Of those who had received training in ICT,
10% received training in the last twelve months and 50% in the last two to three years.

### 4.2.4.2 Focus group findings

All the staff involved with the study felt that the program could be used successfully in the teaching of craft theory but had reservations on the software being used as a standalone method of teaching.

During the focus group one lecturer stated “It is not really suitable for weaker students, they lose interest easily but it could be used as an additional aid for weaker students during the traditional method of teaching” and another stated “No matter how good a program is some students will need individual help and will need things explained in more than one way”.

Some students indicated in the focus group that they would like the lecturers to start using a learning system like this because, “it was more interesting than normal class, it was a different way of learning and it would be as a good revision tool”.

One lecturer believed that the software CD would not work because of lack of availability of a computer lab during class time and students may not use it outside of class time.

### 4.2.4.3 Interview findings

In answer to the question do you feel it would be possible to integrate digital media into the existing teaching method. One staff member believed it would be possible, but it would have to be phased in and all the staff would have to be on board and do their bit. Not all staff is good at computers and there would have to be more tailored training courses offered first.
Chapter 5
Discussion of Findings

5.1 Introduction
This chapter draws together issues from the research findings and discusses them in relation to issues encountered in the review of literature regarding the impact ICT has on teaching and learning in education. The findings have yielded a collection of quantitative and qualitative data which will be compared with data from national and international reports and studies relevant to the issues raised in this study.

Apprentices learning will be discussed as well as the effect of ICT and digital media on apprentice learning. Teacher training and the effect of their pedagogical approach are looked at, as is the role of the school management in relation to ICT. This chapter is based on the findings of the study which combined the results of the questionnaires, focus group, domain reference test and interviews. The findings are crossed referenced through all the data sources to provide a more comprehensive set of findings. The following discussion will be arranged in a format so as to answer the research questions raised in the methodology chapter.

5.2 Discussion of Findings presented by research questions

5.2.1 What effect the learning resource software has in relation to the enhancement of learning for apprentice students?
Brophy’s stated that ICT is impacting on learning in many ways right through to the way in which education is delivered to the student. It was found that this study would agree with this statement, the test group felt that the software program had enhanced their learning and overall learning experience and they enjoyed the element of choice for learning by using the CD and being taught using the traditional method. The results from the questionnaire would also agree with Brophy when he stated that “ICT is changing fundamentally the nature of the learning experience” (Brophy 2001, p.130) from the way in which students and educators interact with one another, to the way students interact with each other and their learning material.
Lieb (1991) suggest that effective applications of technology for adult learning need to be designed in ways that are appropriate to the age and life situations of adult learners. The test group felt that the software did not impede their learning in any way and they found the ease of using the CD compared to notes was also a major factor for using the learning resource. This was also confirmed in the focus group where the students believed that the availability of craft theory information outside of class was an excellent feature, as one student stated “it has given me access to notes outside of college” and queried “where could I get more notes like this”.

Form the researcher’s experience of teaching the topic he found that the software made more time available compared to the traditional method of teaching and it allowed the learning to be individualised. One of the largest challenges for the educator can be the mix of abilities within a group (Daines et al., 1993). The researcher noticed that software assisted the weaker students in that it allowed them to progress at an accelerated rate so as to approximately reach the average skill level within class more quickly. Individualising the learning by the use of software allowed each student to become more engaged and enter their zone of proximal development in order to allow effective learning to occur (Olson & Pratt, 2000 cited by Van Der Stuyf, 2002).

During an interview the interviewee was asked could he think of any reason for not using the software. He replied that he really liked using the software and believed it would be better if other staff started using something like it. It may not be as simple as suggested by the interviewee just to start using software in teaching. With the integration of ICT in teaching and learning requires a fundamental rethink for many teachers of their own deeply held beliefs and attitudes in relation to pedagogy, styles of teaching and their subject (Moursund, 2005).

From interviews, peer review and the focus group, it could be interpreted that the software served the test group well in that they obtained a good level of understanding of the topic and from the observations it was noted that the test students were more involved in the discussion and had more questions during the traditional method of teaching compared to the controlled group.
5.2.2 What change occurred in the learning for each individual learner?

Ginsberg (1998) identifies that technology, when used correctly, has been proven to enhance adult learning. Results from the questionnaire would agree with this, the students felt they had learned something new from the software compared to the traditional method of teaching and the majority of them said that using the software program was enjoyable. Ginsberg also recognized that technology in itself may not be valuable, however when used correctly in a sound educational manner and in a suitable environment with a well trained educator, then benefits gained are maximised.

From observation in the study, individual students from both groups learned via different methods. Some students had a well developed practical intelligence, while other students had a well developed spatial intelligence. Often the facilitator needed to explain some information in a different way when a student could not understand an original explanation. Gardner (1983) first recognized individual intelligences and concluded that an individual’s learning style is expressed as their combination of their intelligences, with their interests and talents being strongly related to the pattern in which they hold the intelligences. Educators should opt to use a multi-sensory approach in the classroom where possible in order to engage best with the majority of students. Digital media is a tool which can encompass a multi-sensory approach. Something which is learning through a preferred intelligence requires minimal effort and is almost impossible to forget (Gardner, 1983).

The media on its own, allowed students to visit an area within the topic as many times as was necessary until a full understanding of the information was achieved. Three quarters of all the students found the first five weeks of craft theory difficult and found it was hard to keep pace with the required learning. While only a quarter of the test students found the chosen topic of craft theory difficult and half of the control group found the topic difficult. These findings were also confirmed in focus group with one student commenting that he found, the volume of information he had to take in during the first few weeks was a bit excessive, but that the CD helped him a bit in
that he did not have to remember it all at once. The benefits of ICT within education when used correctly are well proven. Ginsberg (1998) identified that technology enhances adult learning through flexibility, and that it promotes constructivist and collaborative learning environments. In this study the digital media also aided the learners by improving motivation.

The domain referenced test results achieved were similar for both groups yet it was noticed that the learning methodology for each group during the study was quite different. Due to the use of the software, the test group took charge of their learning more quickly and this helped to motivate the control group during the traditional method of teaching. All students were starting to view themselves more as autonomous and self-directed adult learners (Lieb, 1991).

The students in the focus group were asked what their thoughts were of the learning resource. Their views and comments were that the design was seen as pleasant and consistent with no student having navigational issues; a view supported by the post-training questionnaire. “The CD was great at explaining the process and the video really helped”. Technical content of the CD was identified as being approximately correct by all group members. “The CD was very useful, especially when you miss something as you can go back and re-play it”. This view was also supported later during interviews. These comments agree with Lieb (1991) who suggested that effective applications of technology for adult learning need to be designed in ways that are appropriate to the age and life situations of adult learners.

The research has shown that students will react slightly differently to their learning environment. Different learning styles and the appetite for knowledge demands information to be offered in different ways. E-learning has the ability to offer various methods of learning within a learning environment (BETCA, 2005, B). Educators need to be aware of the ways in which they can address the different learning styles and how different learning resources can assist in embracing these different learning styles. Educators need to develop their approach from one which is a behaviourist approach of Powerpoint slides on a screen being shown repeatedly to one which enhances the students learning in a more constructive manner.
The impression given and general consensus at the focus group was that students preferred the interaction the software program provides with quiz pages, pictures and video as one student commented “it a completely different way of learning”. The test group felt that the learning resource had given them a deeper level of understanding of the topic before being taught using the traditional method. To this end at the focus group session the lectures agreed to introduce as much interaction as possible into their lectures by including more pictures and videos. Educational technology is not and never will be, transformative on its own. It requires teachers who can integrate technology into the curriculum and use it to improve student learning (NCREL 2000).

In this study, the software was proven to serve both the less able students and the more able students by allowing self-paced learning. Importantly, this better overcame the common challenge which is presented by mixed abilities within a class than could be achieved with conventional teaching alone, a view which was also supported by existing research (Daines et al., 1993). In previous classes in order to identify the abilities within each class in the absence of software, the author and his colleagues would identify less able students towards the start of each course, and then try and give these students above average assistance during the class. This method has worked well, but it is far more labour intensive and prone to errors.

5.2.3 Was ICT/digital media effective as a learning tool and what is the educational potential of computers for apprentice students?

For the test group the combination of the digital media with face-to-face contact was effective and it assisted the learning process and allowed effective use of the educator’s time. This time which was freed up was effectively used to aid the less able students in the class in order to boost their skills and achieve a good average knowledge level within the class. In effect the software indirectly acted as an educational accelerator (Kirschner, Clark, Sweller 2006).

The students in the test group believed if there were more topics in craft theory available on CD it would improve their learning. One student commented that he found the volume of information he had to take in during the first few weeks was a bit excessive, but that the CD helped him a bit in that he did not have to remember it all
at once. The students felt they had learned something new from the software compared to the traditional method of teaching. The effect the software had on measurable knowledge gained was barely noticeable from the domain referenced test for both groups. The teaching was less stressful for the educator and consequently more enjoyable, as significantly fewer questions arose to be answered from the group who used the media. This allowed the facilitator the opportunity to make the teaching more personalised for all students (Cox et al., 1999).

From interviews and focus group meetings, students did not visualise that they may need to re-train or up-skill a number of times during their working lives, but in a knowledge based society this will be necessary (Bates, 2000). Not all students in the study could envisage a relevant future use for computers for themselves; with 68.75% saying that computers would be of benefit to them in the future, 25% identified that computers might be of possible benefit and 6.25% said that computers would provide no benefit. The scope of how ICT can be used is wide ranging. It can be used to deliver distance education courses for self-directed adult learners; it can be used to assist educators within the classroom with full time students; or it can be used for online courses which also have an element of attendance in a distributed learning environment (Wang, 2005; Bates, 2000). Computer knowledge is a highly marketable technical skill, and computers - whether the student perceives them as relevant or not at this stage in their lives - will be a required tool for any learner with future education. At the very least, computers will provide the means for the individual to access further e-learning (OECD, 2007).

The majority of the students agreed that computers would improve their learning whether it was just using the internet or a CD-ROM. As one student stated in an interview “I didn’t know that I could learn from computers in this way and I will be more interested in computers from now on”. Imel believed Technology can enhance adult learning because it has the potential to increase flexibility, provide access to expertise, facilitate discussion among learners who cannot meet face to face, reduce feelings of isolation often experienced by non traditional learners, increase learner autonomy, and support and promote constructivist and collaborative learning (Imel, 1998).
For this study, it was also found that only a quarter identified that they would complete a follow-on course in computers in the future, but yet they identified that computer skills was of direct relevance to them. The focus group also named lack of time for self-study as a barrier. This contrasts with the fact that 94% of general apprentice students nationally visualise they are likely to move from an apprenticeship to further education in the coming years (Framework for progression of craftsperson’s 2008). Computing skills will be either direct or indirect elements of any further education undertaken by a qualified carpentry and joinery apprentice.

Software should be suitable for the target audience, as successful software design produces effective e-learning material which successfully marries aspects from technology and education for the learner (Alessi and Trolllip, 2001). The delivery mechanism of a CD-ROM was effective, as it gave a simple, portable medium to students which could be used outside of the classroom. Almost two thirds of the test group indicated that the availability of craft theory information on a CD as being key to using the program. Most believed that the availability of craft theory information outside of class was an excellent feature.

The developed media was portable and was available to students outside of scheduled class time, so consequently the learning could have occurred outside of the classroom, but this did not happen much. The main reasons for this lack of use were identified from interviews, post-training questionnaires and from peer review. One reason was that students proposed that they did not have enough available time due to the workload from other subjects. Another more encouraging reason given for general lack of use of the media outside of the classroom was that students felt that they did need to, as they were happy with their progression and each individual could see the potential benefits the learning resource could offer.

Digital media material should not be over-complex and design and consistency rated well for the software created. Sabatini (2001) identified that the design of a multimedia product or learning system is directly related to the learning it can offer. The content was gauged as being set at a correct level by technical experts; with non-technical experts identifying no educational flaws apart from the lack of sufficient
interaction directly within the software was noted. Interaction within a digital resource is most desirable (Alessi and Trollip, 2001).

Since consistency throughout any resource is of utmost importance in order to maximise the learning potential (Nielsen, 2005), it was an important aspect with this software design. Principles for effective media design come from theory, experience and observational research and the possibilities offered by the technology. The role of the software designer when creating a multimedia product is to encompass these principles to arrive at a quality resource that will provide effective learning. It is critically important the designer be familiar with the domain of knowledge the desired software must encompass (Sabatini, 2001)

5.2.4 What professional development educators require and what level of commitment do they have, for integrating ICT/digital media in education?

Students who have experienced the benefits and potential of the software program, as a learning tool towards achieving their learning goals are anxious that other lecturers would start using programs like this. In one student interview, the student stated “I think it would be a far greater tool if all lecturers used a software program like this in a standard way. This would also encourage students to use it and they would be able to see its advantages”. In order to encourage teachers the effective development of ICT skills and knowledge and enhanced use of ICT in schools, requires a holistic approach comprising appropriate training in terms of skills, knowledge, relevance to educational goals, and priorities, and delivery, ready access to ICT resources and ongoing support and advice to encourage progression beyond any formal training (SOEID 1998).

The focus group also identified a similar theme where the students would like more topics on a learning resource CD. In the questionnaire the students felt that the software program had enhanced their learning and overall learning experience. While half of lecturers believed that the time and effort required putting a topic together on a CD was too great. When this was explored in the one-to-one staff interview some of the reasons behind the reluctance to adopt a learning resource CD were a lack of
expertise with ICT and lack of time during busy life. Student’s willingness to respond, accept and adapt to new technologies is not something new and comes as no major surprise. Researchers have found that students take up of new technologies and systems are generally much quicker than staff take up. For example, Chee’s (2002) findings showed that a student’s appetite for online resources is generally much greater than the educators who deliver the subject matter.

When the staff were asked if they felt the learning resource enhanced the students learning experience just over half felt it would and the rest feeling either it would not or were unsure whether it would or would not. The students on the other hand were more positive about the learning resource they felt that the software program had enhanced their learning and overall learning experience. Current research in the UK offers valuable insights into how ICT may in fact be a key trigger in supporting teachers. Teachers who engage with ICT in the classroom have reported that ICT is more suited to support collaborative learning, active learning, enquiry etc. than traditional teaching pedagogies. Additionally, the use of ICT in education has consistently been equated with other broader educational goals (N.C.C.A., 2004).

Some students indicated in the focus group that they would like the lecturers to start using a learning system like this because, “it was more interesting than normal class, it was a different way of learning and it would be as a good revision tool”. Brophy’s (2001) findings were similar in that technology changes the nature of the learning experience, in this case using a learning resource CD compared to teaching with black and white notes and Power point slides on a screen.

With the staff believing that the time and effort required putting a topic together on a CD was too great. Research has that ICT involves significant input in terms of planning, preparation and follow-up of lessons (Cox et al., 2003). Free time in which to plan and prepare for the integration of ICT into teaching has to be taken into account. It is difficult for teachers to upgrade their ICT skills, receive training on how to incorporate ICT into their teaching, plan and prepare for that integration in an already busy schedule (BECTA, 2003 A).
A small minority of staff were unsure about the educational value of the software learning resource for the students. One lecturer believed it would not work because of lack of availability of a computer lab during class time and students may not use it outside of class time. The lack of access to ICT equipment due to organisational factors such as the deployment of computers in ICT suites rather than classrooms is creating a barrier for teachers (Cuban et al. 2001).

Continuing Professional Development for educators serves both themselves in terms of development, and the student in terms of enabling the learning to be made more effective. As stated in the OECD (2007) report the impact of ICT on educational quality and the effect on the learning, along with other benefits, all flow from the way in which the technology is used. The same tools in the hand of another teacher will produce different outcomes. The adoption and implementation of ICT is a process of educational change, as opposed to it being a technical issue. It is to do with teachers’ beliefs and pedagogical practices (OECD, 2007).

For a teacher to change their teaching methods and incorporate technology they must have time, confidence, motivation, training, the proper technology supported environment and the incentive to do so. (Loxley, Julien, 2005). When the staff were asked if they felt that a learning resource like this would increase or decrease their workload, they all believed that their workload would increase dramatically initially but once the system would be up and running it probably would reduce the workload, especially with the weaker students. In a BECTA 2004 report that cited Dawes who suggested that even with the optimal situation these changes do not take place over the course of a year. It is reasonable to expect a 3-5 year period for the teacher to develop appropriate curriculum and incorporate technology that effectively supports it.

From this study, the fact that the majority of apprentice students arrived at a third level educational centre in 2009 with an absence of knowledge of basic computing skills is testament to the fact that IT2000 has not been effective for all students. 56% of the students in this study considered their ability to use computers as fair or poor. Mulkeen (2004) visualised this ineffectiveness when he criticised IT2000 saying that its momentum to achieve change was very slow. For the students involved in the
Pedagogical training was identified as being central to using ICT well and maximising the learning in the classroom, but although certain training was available in the institute little was completed prior to 2006. The training which has been undertaken in the last few years occurred mostly as a result of a staff-led movement starting with individual enthusiasts. Recent staff training has been instrumental in improving the instruction offered to learners (BECTA, 2005 B). ICT alone is a technical issue, however integration focused training is more important and its ultimate aim is to achieve effective learning within the classroom. Effective use of ICT is as much about the teacher’s beliefs and practices as about the technology itself (OECD, 2007).

In 2005, 75% of staff in this department, including the author, had no formal pedagogical training. Many had high level Carpentry and Joinery related qualifications. Between 2006 and 2009 50% of staff engaged in and have completed pedagogical training, thus allowing meaningful change to occur within the classroom which will best serve the educational requirements of learners (OECD, 2007; BECTA, 2005 B). Effective training for the educator gives both the educator and students the skills to become lifelong learners (DETE, 2003; Miller, 2002).

A range of organisational factors, such as the commitment of the head of school and good forward planning, were correlated with successful implementation of the use of ICT, and the commitment of staff played a pivotal role in the process. However, the implementation of new technology needs to be managed properly, to ensure the continued commitment of teachers (Cox et al., 2003). Staff have embraced pedagogical training well in the department of engineering technology with half of staff having engaged in and completed pedagogical training since 2006. School management needs to provide a support structure in which to support and grow an ICT culture within the school, and should attempt to encourage even the most hesitant educators to engage in pedagogical training (OECD, 2007).
During the focus group and also in interviews staff expressed concern that the students may not use the software outside of class time. Yet when the lecturers were asked if they would use the learning resource for carrying out course assessments over half of them agreed and believed it may guarantee that the students would use the program outside of class and it may be a good way to assess whether the students were learning from it. Teachers need to be encouraged by administrators, particularly their head of school, to participate in training activities. Administrators need to ensure that teachers have adequate time to participate, and do not have to sacrifice too much personal time to do so. But, in addition to time allocation, supervisors should recognise publicly teachers who successfully complete professional development courses. This provides immediate personal reward to teachers, raises their status in the eyes of their peers and encourages others to participate (Improving Professional Development Practices, 1998).

5.3 Summary of Research questions.
In answer to the question on the effect the learning resource software had in relation to the enhancement of learning for the apprentice students. Results from all the data collection instruments show that the learning resource did enhance the learning for the students. The students were very positive in their answers in the questionnaire towards the software they felt that the software program had enhanced their learning and overall learning experience. This result showed that this question agreed with Brophy when he stated that “ICT is changing fundamentally the nature of the learning experience” from the way in which students and educators interact with one another, to the way students interact with each other and their learning material (Brophy 2001, p.130).

The researcher noticed a change in the learning for each individual learner as the software proved to serve both the less able students and the more able students by allowing self-paced learning. This helped overcome the challenge which the researcher faces each new term with mixed abilities within a class, a view which was also supported by existing research (Daines et al., 1993). And also due to the use of the software it was felt that the test group took charge of their learning more quickly
and this helped to motivate the control group during the traditional method of teaching.

Although the effect the software had on measurable knowledge gained was barely noticeable from the domain referenced test for both groups. The students experience of using the software was very positive with the students feeling they had learned something new from the software compared to the traditional method of teaching. The researcher also felt that the teaching was less stressful and more enjoyable, as significantly fewer questions arose from the group who used the media. Also for the students who used the learning resource a quarter of them found the topic difficult compared to half of the control group. For this study, the students identified that computer skills were of direct relevance to them and the students could see the educational potential of computers and digital media. Yet only a quarter of the students identified that they would complete a follow-on course in computers in the future compared to 94% of apprentices were likely to progress from an apprenticeship to further education, according to Framework for progression of craftsperson’s (2008). Whether the students perceive computers as relevant or not at this stage in their lives - will be a required tool for any learner with future education.

In answering the question on the level of commitment educators have in integrating ICT/digital media in education. Half of staff in this study believed that the time and effort required to put a topic together on a CD was too great and just over half felt the learning resource enhanced the students learning experience. According to a BECTA 2003 report free time in which to plan and prepare for the integration of ICT into teaching has to be taken into account. It is difficult for teachers to upgrade their ICT skills, receive training on how to incorporate ICT into their teaching, plan and prepare for that integration in an already busy schedule (BECTA, 2003 A). Continuing Professional Development for educators serves both themselves in terms of development, and the student in terms of enabling the learning to be made more effective. As stated in the OECD (2007) report the impact of ICT on educational quality and the effect on the learning, along with other benefits, all flow from the way in which the technology is used. In this study it was found that staff has embraced pedagogical training well in the department of engineering technology with half of the staff having engaged in and completed pedagogical training since 2006. School
management needs to provide a support structure in which to support and grow an ICT culture within the school, and should attempt to encourage even the most hesitant educators to engage in pedagogical training (OECD, 2007).
Chapter 6
Conclusion

6.1 Conclusion

It is vital to recognize that ICT is important and that we are living in an information society. The educational requirements of apprentice Carpentry and Joinery in the future needs to be closely monitored in order to ensure each individual has the necessary skills to remain competitive. Previously increased wage demands in Ireland, and the high cost of living threaten the stability of the construction industry. However now that there is a recession taking hold of the country and employment in the construction industry has been decimated all apprentices will need to analyse the direction they are taking and maybe revise their future goals. They may need to up-skill in order to secure quality employment in the future. Whether through full time or part time courses or even distance learning they will need to have sufficient computing skills to use ICT effectively. This may be necessary in the short term, but the benefits will be reaped by all concerned in the long term. ICT can also greatly assist those who need to up-skill, as it has the potential to bring the learning to the learner and remove common barriers such as time and location (OECD, 2007). Since workers will need to re-train up to five times during their working lives (Bates, 2000), each is likely to use ICT skills to assist in this to some degree (National Skills Strategy Report, 2005).

Pre-requisite factors are required to assist the uptake of ICT, such as; government policy, school policy, access to enough reliable equipment, good support structures, and the teachers’ own abilities and beliefs in relation to ICT and pedagogy. These factors will not guarantee the adoption of ICT, but are likely to stop it from occurring (OECD, 2007). This is more important than ever when one considers that half a million people across all sectors will need to up-skill over the coming years in order to secure employment, and keep the Irish economy competitive (National Skills Strategy Report, 2005).

Alarmingly for this study it was found that apprentice computing skills were poor. This is especially significant when one considers that these are the children of the
digital generation who were in Post-Primary education when IT2000 was fully implemented. IT2000 did not seem to have the impact it was designed to have in the Post-Primary sector for all of these students. The reasons for this are many and varied; ranging from governmental level barriers such as funding, school barriers such as access and facilities, teacher barriers such as training and teaching approach, and student level barriers such as a lack of desire to make substantial efforts as they perceive that computers are of little practical relevance.

The link between the user and the computer has been dependent on two main factors, the hardware and the software. Because of continuing advances in technology, limitations due to hardware are disappearing. The software or more specifically the user interface is now the most important determinant of success of computer systems. The focus of educators now must be on the actual software not the ever changing hardware. Some of the most frequently encountered problems are; software and hardware incompatibility, lack of effective and efficient software, a shortage of technically or pedagogically skilled people and differences of opinion on how best computers should be used within education. Despite these common difficulties, the use of computers within education is a rapidly growing area, and is set to increase further in the coming years.

Any computer educational resource must be a balance between technology and solid educational theory. Educators must be involved in the design of new software as they are the experts in the field. Commercial organizations have different objectives i.e. profit and therefore this whole area cannot be left open to purely commercial influences. The cost of some specialist software can be high, and some software will most probably come with an annual maintenance contract, thus increasing the expense (Sillanpää and Ilomäki, 2004). It is critically important the designer be familiar with the domain of knowledge the desired software must encompass (Sabatini, 2001) Initiatives which involve teachers producing educational material should receive greater funding and be promoted more by management and department of Education.

Continuing Professional Development for educators serves both themselves in terms of development and the student in terms of enabling the learning to be made more effective. As stated in the OECD (2007) report the impact of ICT on educational
quality and the effect on the learning, along with other benefits, all flow from the way in which the technology is used. The same tools in the hand of another teacher will produce different outcomes. The adoption and implementation of ICT is a process of educational change, as opposed to it being a technical issue. It is to do with teacher’s beliefs and pedagogical practices (OECD, 2007).

The requirement for additional training on both the basics of ICT and the different pedagogical approaches were seen as a major requirement by staff to improve the overall learning experience of the students. For example, teachers who are engaging with the implementation of ICT find greater opportunities to engage their students with collaborative learning, active learning, enquiry etc. than traditional teaching pedagogies. As a result teachers are experiencing a change in their own teaching as an outcome of this realisation (N.C.C.A., 2004). Educational technology is not, and never will be, transformative on its own. It requires teachers who can integrate technology into the curriculum and use it to improve student learning.

In this study it was found that the students who experienced the benefits and potential of the software program, as a learning tool towards achieving their learning goals were anxious that other lecturers would start using programs like this. The majority of the test group felt that the software program had enhanced their learning and overall learning experience. On the other hand staff were not as positive about the learning resource with just over half the staff agreeing that the learning resource would enhanced the students learning experience. One issue which was noted by the researcher and other staff during the focus group was that the students were becoming frustrated with poor quality lecture notes and power point presentations. To this end all staff agreed to address this issue immediately. The inability or unwillingness for some staff to use digital media and ICT in teaching is clearly frustrating to the students and it is equally frustrating for staff who would like other staff members to embrace ICT and use it to its full potential.

How ICT is used is perhaps the key issue. Only when ICT becomes part of the curriculum and assessment will widespread uses occur. A new style examination which puts the emphasis on self directed learning, continuous assessment and project work would be a way of realising the potential of ICT in apprentice education. From
the research carried out it is clear that incentives need to be put in place for both staff
and students to use ICT digital media on a more regular basis. For the moment until
there is a review of the curriculum a possible way of achieving this would be more
preparation time for staff and the awarding of additional marks for students at least
until they are able to appreciate the educational value that it offers them. This would
be difficult to implement at first but with definite guidelines and a whole school
approach from lecturers, course coordinator and department head it would be
achievable.

The effect the software had on measurable knowledge gained was barely noticeable
from the domain referenced test for both groups. The teaching was less stressful for
the educator and consequently more enjoyable, as significantly fewer questions arose
to be answered from the group who used the media. The researcher noticed that the
software assisted the weaker students in that it allowed them to progress at much the
same rate as the other students, which may not have happened previously.

Individualising the learning by the use of software allowed each student to become
generally more engaged and enter their zone of proximal development in order to allow
effective learning to occur.

The software learning resource used in this research met the learning outcomes for the
apprentice students. However, these outcomes were also met almost to the same
extent by the group of students who were taught using traditional teaching method.

What was discovered from the research was that the teacher is central in relation to
the learning effect when using digital media. The same technology in the hands of
different teachers will produce vastly different results. The media design is important
because using poorly designed material which disadvantages the student. The use of
ICT is not a technical issue but rather one of educational change; and this is a much
more complex issue. The effect of digital media is as much about beliefs and
pedagogical practices, as about technology and media.

To move away from using the digital media with these students would be a step
backwards, particularly as due to their prior experience of learning they are not in a
position to be totally self-directed in their learning.
Digital media is a powerful educational tool and has a lot to offer in relation to enhancing learning opportunities. Used correctly, it has the potential to lead apprentice students the first few steps into taking responsibility for their own learning. This is a lifelong skill that will stand to all these students in their future learning.

6.2 Limitations of the study

Each study will have limitations and it is important to recognize these as they will impact upon the validity of the study to some extent. Unnaturally modified behaviour such as the ‘Hawthorne Effect’ was not noticed to any large degree during the study.

It was found that staff was not as willing as the students to complete their questionnaire. It took a lot of reminders and still all the question was not completed. It was suggested by one member of staff after the study was completed that even though they were assured that the questionnaire would be anonymous, he felt that some of the staff training questions were too personal to answer.

For the two interviews conducted, both candidates lacked good interpersonal skills, and as a result the interviews did not flow as freely as they might have done with more experienced interviewees. Every effort was made to make the candidates feel at ease as the interview was conducted more like a social encounter as opposed to a formal interview. It was felt that this nervousness inhibited the responses of the candidates.

For this study it may have been useful to conduct the research for a longer period of time and create learning resources for a number of craft theory topics in order to get a more comprehensive set of results. It was felt that the students were very enthusiastic about the learning resource mainly because it was new and it gave them a different way of learning. Yet as seen in the results of the domain referenced test there was only an average of 7.5% between the test group and the control group which was small considering that the test group were taught in a completely different way to the controlled group.
6.3 Recommendations

This case study has highlighted a number of issues that must be taken into account when introducing a software learning resource for the first time. These issues were identified and suggestions for improvements were made. In addition, a number of areas exist where further investigation is required in order to achieve a complete picture and better serve the learning requirements of the apprentice carpentry and joinery student. These areas include:

- For future studies introduce more than one topic of craft theory as a learning resource to give a broader set of results and help the students to become more familiar with using computers as a learning tool.

- Initiatives which involve teachers creating software learning resources for their subject areas should receive greater funding and be promoted more by management and the Department of Education.

- Continued professional development for teachers in the use of ICT should involve courses which are focused on their specialised area of teaching and learning.

- Develop a website displaying all craft theory subjects as a learning resource where the subjects would be available to all carpentry and joinery students nationwide. This would be particularly beneficial to students who need to revise for repeat exams.

- Include a module on basic computer skills training within Phase Two. This module should be a general introductory ICT subject and should be fundamentally common across all apprenticeship programmes, but could be tailored slightly to suit each apprenticeship trade.
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Appendix A

Form of Consent

I, David Loftus am currently doing a research project investigating whether the learning of a topic in Craft Theory can be improved for Carpentry and Joinery Apprentices by using a tool of Digital Media as a learning resource.

I am formally asking you to participate in my research. In order to explain that you are a willing participant in the research, I need each person to sign this form.

All information received will be treated confidentially, thanking you for your cooperation.

Signed _____________________ (Student)

Researcher _____________________

Date _____________________
Appendix B
Pre Training Questionnaire

Please fill in the following questions as accurately as possible the options that most closely represent what you think. I would like to express my gratitude for your help as without you the study would not be possible.

Q1. Have you completed any of the following?
Junior Certificate ______________
Leaving Certificate _____________
Third level Qualification ___________

Q2. Where did you complete most of your previous computer training?
Primary_____________________
Secondary___________________
Third Level__________________
Other_______________________
If other, please specify ________________________________________________

Q3. Have you already completed some basic computer training?
Yes ______
No ______

Q4. If yes, please state which training have you completed?
Internet_____________________
Microsoft Word_________________
Microsoft Powerpoint__________
Microsoft Excel_________________
Email_______________________
File management________________
Other________________________

If other, please specify ________________________________________________
Q5. Of the training areas you have already completed, which ones do you feel are relevant for you?
Internet_____________________
Microsoft Word_______________
Microsoft Powerpoint__________
Microsoft Excel_______________
Email_______________________
File management______________
Other_______________________

Q6. Are you competent with File Management (Using Folders and Cut, Copy, Paste and Rename commands)?
Yes _______
No _______

Q7. Have you completed the European Computer Driving Licence (E.C.D.L.) course?
Yes _______
No _______

Q8. How would you rate your current computer ability?
Poor________________________
Fair_________________________
Good________________________
Excellent____________________

Q9. Do you have the use of a personal computer?
Yes _______
No _______

Q10. If yes, what do you use it mostly for?
____________________________________________________________________
Q11. Do you think that computers are of benefit to you now?
Not at all □
Maybe □
Definitely □

Q12. Do you believe that computers will be of relevance to you in the future?
Not at all □
Maybe □
Definitely □

Please feel free to add any additional information or comments, which you feel may be relevant.
_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________
Appendix C
Pre Training Questionnaire Findings

Q1. Most recent qualification

![Bar chart showing the distribution of most recent qualifications: Junior Cert 15.625%, Leaving Cert 81.125%, Third Level 3.125%]

Q2. Where did you complete most of your previous computer training?

![Bar chart showing the distribution of previous computer training locations: Secondary 90.6%, Primary 9.4%, Third Level 3.125%, Other 6.25%]

Q3. Have you already completed some basic computer training? 100% Yes

Q4. If yes, please state which training have you completed?

![Bar chart showing the distribution of computer training completed: Internet 56%, MS Word 43.5%, MS Powerpoint 31.5%, MS Excel 12.5%, Email 56%, File management 56%]
Q5. Of the training areas you have already completed, which ones do you feel are relevant for you?

![Bar chart showing the percentage of completed computer training]

Q6. Are you competent with File Management (Using Folders and Cut, Copy, Paste and Rename commands)?

50% Yes
50% No

Q7. Have you completed the European Computer Driving Licence (E.C.D.L.) course?

25% Yes
75% No

Q8. How would you rate your current computer ability?

![Bar chart showing the percentage of computer ability ratings]

Q9. Do you have the use of a personal computer?

62.5% Yes
37.5% No
Q10. If yes, what do you use it mostly for?
No.1 - Internet
No.2 - Music
No.3 - Microsoft Word

Q11. Do you think that computers are of benefit to you now?

Q12. Do you believe that computers will be of relevance to you in the future?
Appendix D

Post Training Questionnaire

Please fill in the following questions as accurately as possible the options that most closely represent what you think. I would like to express my gratitude for your help as without you the study would not be possible.

Section A

Q1. How would you rate your current computer ability?
   Poor________________________ □
   Fair________________________ □
   Good________________________ □
   Excellent________________________ □

Q2. Do you think that computers are of benefit to you now?
   Not at all________________________ □
   Maybe________________________ □
   Definitely________________________ □

Q3. Do you believe that computers will be of relevance to you in the future?
   Not at all________________________ □
   Maybe________________________ □
   Definitely________________________ □

Q4. How did you find the first five weeks of craft theory?
   Easy________________________ □
   Fair________________________ □
   Difficult________________________ □

Q5. How did you find the chosen topic in craft theory?
   Easy________________________ □
   Fair________________________ □
   Difficult________________________ □
Q6. Would you consider doing computer course in the future?
Yes _________ □
No_________ □
May be_______ □

Q7. Did you use the training CD during the course?
Yes _____ □
No _____ □

Section B – Effect of software on learning

Q1a. Approximately how many times did you use the software outside of class time?
Never____________________ □
Once____________________ □
Twice____________________ □
Just while studying for exam _ □
Other____________________ □
If other, please specify _________________________________________________

Q1b. If you did not use the CD much was there any particular reason for this?
_____________________________________________________________________
_____________________________________________________________________

Q2. Did you find the CD relevant to you?
Yes _____ □
No _____ □

Q3. Did you find the topic covered enjoyable?
Yes _____ □
No _____ □
Q4. Did you feel the software enhanced your learning?
Yes _____ □
No _____ □

Q5. Did you feel the software impeded your learning in any way?
Yes _____ □
No _____ □
If yes, please specify ________________________________

Q6. What would you feel would be the main reason for using the software CD compared to notes?
On a CD _______ □
In Colour_______ □
Other _________ □
If other, please specify ________________________________

Q7. Which would you find easier to use
Software CD______ □
Notes____________ □

Q8. Which method of learning would you prefer?
Notes alone__________ □
CD on its own_________ □
Notes with CD_______ □

Q9. Which do you believe using a software CD would do?
Replace face to face teaching________ □
Use as a standalone program________ □
Enhancement to using notes________ □

Q10. If there were more topics in craft theory available on CD do you believe it would improve your learning?
Yes _____ □
Q11. Did you feel you learned something new from the software compared to the traditional method of teaching?
Yes ______ □
No ______ □

Q12. Did you feel you received a deeper level of understanding of the topic before being taught using the traditional method?
Yes ______ □
No ______ □

Q13. Would you use the software to help with studying for your exam?
Yes ______ □
No ______ □

Q14. Have you ever use a learning resource software program to learn a subject on a course you have completed?
Yes ______ □
No ______ □

Q15. While using the software, if you needed assistance, which of the following are you most lightly to do?
Ask the Teacher ______________ □
Ask the Person beside you_______ □
Look up the Help menu_______ □

Section C - Software related questions

Q1. How was the General Layout of the Software?
Poor_________ □
Fair__________ □
Good__________ □
Q2. How did you find the Navigational Systems to use?
Excellent □
Poor □
Fair □
Good □
Excellent □

Q3. Did you enjoy the ability to navigate – any page, any time?
Yes □
No □

Q4. Do you believe you visited all pages on the software?
Yes □
No □

Q5. Was the software content relevant?
Yes □
No □

Q6. Was the software easy to use?
Yes □
No □

Q7. How did you find the level of software?
Too easy ________________ □
Correct ________________ □
Too Hard ________________ □

Q8. How was interactivity of the software?
Not enough ________________ □
Enough ________________ □
Too much ________________ □
Q9.  Was the 'Site Map' useful?
Yes ______  □
No ______  □

Q10.  Did you complete a self test?
Yes ______  □
No ______  □

Q10a. If yes, was the scoring useful for the self tests?
Yes _____ □
No ______ □

Q10b. If yes, how was the level of difficulty for the self tests?
Too easy__________________ □
Correct__________________ □
Too Hard__________________ □

Q11.  Did you complete all the self tests?
Yes _____ □
No ______ □

Q12.  Did the graphics help with the content of text?
Yes _____ □
No ______ □
Appendix E

Post Training Questionnaire findings

Please fill in the following questions as accurately as possible the options that most closely represent what you think. I would like to express my gratitude for your help as without you the study would not be possible.

Section A

Q1. How would you rate your current computer ability?

![Bar chart showing percentage of responses]

Q2. Do you think that computers are of benefit to you now?

![Bar chart showing percentage of responses]

Q3. Do you believe that computers will be of relevance to you in the future?

![Bar chart showing percentage of responses]

Q4. How did you find the first five weeks of craft theory?

- 25% - Fair
- 75% - Difficult
Q5. How did you find the chosen topic in craft theory?

<table>
<thead>
<tr>
<th></th>
<th>Test Group</th>
<th>Control Group</th>
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<tbody>
<tr>
<td>75% - Fair</td>
<td></td>
<td>50% - Fair</td>
</tr>
<tr>
<td>25% - Difficult</td>
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<td>50% - Difficult</td>
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</table>

Q6. Would you consider doing computer course in the future?

25% - Yes
25% - No
50% - May be

Q7. Did you use the training CD during the course?

50% Yes
50% No

Section B – Effect of software on learning

Q1a. If yes, how many times would you have used the CD after first day?

![Bar Chart]

Q2. Did you find the CD relevant to you?

87.5% - Yes
12.5% - No

Q3. Did you find the topic covered enjoyable?

93.75% - Yes
6.25% - No

Q4. Did you feel the software enhanced your learning?

75% - Yes
25% - No

Q5. Did you feel the software impeded your learning in any way?

6.25% Yes
93.75% - No

Q6. What would you feel would be the main reason for using the software CD compared to notes?

62.5% - On a CD
12.5% - In Colour
25% - Other
Q7. Which would you find easier to use
68.75% - Software CD
31.25% - Notes

Q8. Which method of learning would you prefer?
6.25% - Notes alone
6.25% - CD on its own
87.5% - Notes with CD

Q9. Which do you believe using a software CD would do?

Q10. If there were more topics in craft theory available on CD do you believe it would improve your learning?
75% - Yes
25% - No

Q11. Did you feel you learned something new from the software compared to the traditional method of teaching?
87.5% - Yes
12.5% - No

Q12. Did you feel you received a deeper level of understanding of the topic before being taught using the traditional method?
68.5% - Yes
31.25% - No

Q13. Would you use the software to help with studying for your exam?
75% - Yes
25% - No

Q14. Have you ever use a learning resource software program to learn a subject on a course you have completed?
6.25% - Yes
93.75 - No
Q15. While using the software, if you needed assistance, which of the following are you most likely to do?
81.25% - Ask the Teacher
6.25% - Ask the Person beside you
12.5% - Look up the Help menu

Section C - Software related questions

Q1. How was the General Layout of the Software?

[Bar chart: 0% Poor, 25% Fair, 43.75% Good, 31.25% Excellent]

Q2. How did you find the Navigation Systems to use?
50% - Good
50% - Excellent

Q3. Did you enjoy the ability to navigate – any page, any time?
100% - Yes

Q4. Do you believe you visited all pages on the software?
81.25% - Yes
18.75% - No

Q5. Was the software content relevant
100% Yes

Q6. Was the software easy to use?
75% - Yes
25% - No

Q7. How did you find the level of software?
18.75% - Too easy
68.75% - Correct
12.5% - Too Hard

Q8. How was interactivity of the software?
25% - Not enough
62.5% - Enough
12.5% - Too much
Q9. Was the 'Site Map' useful?
56.25% - Yes
43.75% - No

Q10. Did you complete a self test?
100% - Yes

Q10a. If Yes, was the scoring useful for the self tests?
50% - Yes
50% - No

Q10b. If Yes, how was the level of difficulty for the self tests?
12.5% - Too easy
75% - Correct
12.5% - Too Hard

Q11. Did you complete all the self tests?
62.5% - Yes
37.5% - No

Q12. Did the graphics help with the content of text?
100% Yes
Appendix F
Focus Group pointers and comments

This focus group consisted of four students and two members of staff.

Pointers

- Benefits and effectiveness of using digital media
- Any issues arise during the test
  - Technical nature
  - Software problems
  - Computer problems
- Best method of implementing the software.
- Any change in learning as a result of using the software
- Content level of software
- Software as a learning tool
- Reasons for rejecting the software
- Availability of assistance while using the software
- Use of CD after test was complete
- Use of CD
  - Technical content
- Design
- Navigation
- graphics
- Suitability
- Interaction
- Possible improvements
- Overall effectiveness

**Comments**

Student C  “When it’s hard to understand what a teacher is explaining you can read these explanations again and again”.

Student C  “I would use this program to help me when I am studying for my exams”.

Student D  “It’s easier to learn if you are face-to-face with the teacher. But if you needed help at home I suppose it would help”.

Student B  I didn’t know much about how to use computers and I felt a bit stressed and unsure using the software.

Student A  “It has given me access to notes outside of college” “where could I get more notes like this”.

Student B  I found the volume of information we covered was too much to take in at once, but the CD helped me a bit in that I did not have to remember it all at once.

Student B  “I nearly gave up on week two” and “I needed a good bit of help during the first few weeks.”
Student A  “The CD was great at explaining the process and the video really helped”.

Student D  “The CD was very useful for the first few weeks, especially when you miss something as you can go back and re-play it”.

Student B  ‘the people beside me were busy and I didn’t like to ask for help’.

Student C  “it was more interesting than normal class, it was a different way of learning and it would be as a good revision tool”.

Student A  “I enjoyed using the software but I didn’t use it after the first day, because I felt I learned all I was going too from it”

Staff A  “It is not really suitable for weaker students, they lose interest easily but it could be used as an additional aid for weaker students during the traditional method of teaching”

Staff A  “No matter how good a program is some students will need individual help and will need things explained in more than one way”.

Staff B  It would not work because of lack of availability of a computer lab during class time and students may not use it outside of class time.

Staff B  “I don’t think it would work as a standalone method of learning. Unless there were assessments as part of it, which the students could email their answers sheet to us as they were doing them”.

Staff A  “the content level looked to be set at the right level for phase four”.

Staff B  “I don’t think it would be suitable for all craft theory topics but for a lot of the topics which have a large amount of content. It would help the teaching, as the students could study the topic themselves before class”.
Appendix G
Interview notes

Interviewee One – Main points arising from Interview

BACKGROUND
Not willing to be recorded as feels not practiced at interviews
From Co. Mayo
Age 22
Leaving Certificate - Yes

Interview questions
Q1. How would you rate your current computer ability?
Poor to fair. Did a bit in secondary school and nothing really since
Q2. Do you think that computers are of benefit to you?
Yes, I notice the lads using the computers at break time for checking their emails and looking up auto trader.
Q3. Do you believe that computers will be of relevance to you in the future?
Not sure really. I don’t know what I will be at in the future
Q4. How did you find the first five weeks of craft theory?
A lot of work but doable
Q5. How did you find the chosen topic in craft theory?
Interesting, I learned a lot about it.
Q6. Would you consider doing computer course in the future?
Not really, depends on what the course was about.
Q7. Did you use the training CD during the course?
Yes

Section B – Effect of software on learning
Q1a. Approximately how many times did you use the software outside of class time?
Once. (The day before our midterm exam).
Q1b. Did it help with your study?
Yes, I felt it did.

Q1c. If you did not use the CD much was there any particular reason for this?
Not really. I didn’t feel I needed to.

Q2. Did you find the CD relevant to you?
Yes, I think so.

Q3. Did you find the topic covered enjoyable?
Yes. I didn’t know that I could learn from computers in this way and I will be more interested in computers from now on.

Q4. Did you feel the software enhanced your learning?
It didn’t do any harm anyway.

Q5. Did you feel the software impeded your learning in any way?
No not at all,

Q6. What would you feel would be the main reason for using the software CD compared to notes?
Being able to see a picture in colour made it easier to understand compared to seeing the same black and white picture in the notes.

Q7. Which would you find easier to use notes or the CD
The CD, but I don’t have access to a computer outside of college.

Q8. Would you consider is there any reason for not using the software
No, I really like using it. It was the first time I used something like this and I think it would be a far greater tool if all lecturers used a software program like this in a standard way. This would also encourage students to use it and they would be able to see its advantages.

Q10. If there were more topics in craft theory available on CD do you believe it would improve your learning?
Yes. It would make the learning more interesting.

Q11. Did you feel you learned something new from the software compared to the traditional method of teaching?
Not really sure. The colour pictures and the video really helped me understand the processes.

Q12. Did you feel you received a deeper level of understanding of the topic before being taught using the traditional method?
Yes definitely, I knew exactly what you were talking about during class and any question I had after using the CD, you cleared them up.

Q13. Would you use the software to help with studying for your exam?
Yes I did

Q14. Have you ever use a learning resource software program to learn a subject on a course you have completed?
No

Q15. While using the software, if you needed assistance, which of the following are you most lightly to do?
Ask the Teacher
Ask the Person beside you
Look up the Help menu
I would probably ask the Teacher

Section C - Software related questions
Q1. How was the General Layout of the Software?
I thought it was good. Its look very professional

Q2. How did you find the Navigational Systems to use?
Good, it was easy to follow.

Q3. Did you enjoy the ability to navigate – any page, any time?
Yes. But it was easy to get lost and maybe skip stuff without knowing.

Q4. Do you believe you visited all pages on the software?
I think so.

Q5. Was the software content relevant?
Yes the content was much the same as the notes but better.

Q6. Was the software easy to use?
Yes

Q7. How did you find the level of software?
Good. A bit too much reading on some pages.

Q8. How was interactivity of the software?
Good

Q9. Was the 'Site Map' useful?
I didn’t use it.

Q10. Did you complete a self test?
Yes
Q10a. If yes, was the scoring useful for the self tests?
Yes, it was fun to compare scores with the lads beside me.

Q10b. If yes, how was the level of difficulty for the self tests?
I found it easy enough

Q11. Did you complete all the self tests?
Yes

Q12. Did the graphics help with the content of text?
Yes

Interviewee Two – Main points arising from Interview

BACKGROUND
Preferred not to be recorded
From Co. Galway
Age 23
Leaving Certificate - Yes

Interview questions
Q1. How would you rate your current computer ability?
Very average

Q2. Do you think that computers are of benefit to you?
Yes. Nowadays everyone seems to have a computer and be able to buy things on line.

Q3. Do you believe that computers will be of relevance to you in the future?
Yes. Everything seems to be going that way, from shopping, booking holidays Banking.

Q4. How did you find the first five weeks of craft theory?
Difficult enough at times.

Q5. How did you find the chosen topic in craft theory?
There was a lot to learn in it

Q6. Would you consider doing computer course in the future?
Maybe depends on what I am doing.

Q7. Did you use the training CD during the course?
No
Appendix F

Observation

Observation comments
Some students were not watching the demo on the screen and now don’t know what to do.

The students are enjoying the feedback from the test on the software.

The test group seemed to be learning more rapidly than the control group.

The students who used the software program were more involved in the class discussion and had more questions and points to make on the topic during the traditional method of teaching than the students who were not.

Observation Tables

<table>
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<th>Type</th>
<th>Percent</th>
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<td>15%</td>
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<tr>
<td>2 Student to students</td>
<td>5%</td>
</tr>
<tr>
<td>3 Student to Facilitator</td>
<td>55%</td>
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<tr>
<td>4 Students to Facilitator</td>
<td>15%</td>
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<tr>
<td>5 Facilitator to student</td>
<td>50%</td>
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<td>6 Facilitator to students</td>
<td>70%</td>
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<td>7 Student to self</td>
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</tr>
<tr>
<td>8 Task in hand</td>
<td>95%</td>
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<tr>
<td>9 Previous task</td>
<td>55%</td>
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<tr>
<td>10 Future task</td>
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<tr>
<td>11 Non-task</td>
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</table>
## Test Group - Traditional methods and CD

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<td>2  Student to students</td>
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<td>7  Student to self</td>
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<td>8  Task in hand</td>
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<td>9  Previous task</td>
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<td>10 Future task</td>
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Appendix I
Staff Questionnaire

Please fill in the following questions as accurately as possible the options that most closely represent what you think. I would like to express my gratitude for your help as without you the study would not be possible.

Q1. Do you believe that the learning resource software could be used successfully for teaching apprentice students craft theory?
Yes _____  
No _____

Q2. Would you consider using a software learning resource instead of your current method of teaching?
Yes _____  
No _____

Q3. From the given list, which would you choose as been appropriate for using the learning resource software?
Replace face to face teaching_________  
Use as a standalone program_________  
Enhancement to using existing notes ___

Q4. Do you believe that the learning resource would enhance the students learning experience?
Yes _____  
No _____  
Unsure ___

Q5. Do you feel the software would impede the students learning in any way?
Yes _____  
No _____  
If yes, please specify _________________________________________________

Q6. What level of understanding of a topic do you feel the students would received by using the software before being taught using the traditional method?
No Change _____  
Deeper level ____

Q7. For the time it takes to create learning resource software CD, do you believe it would be worth the time and effort?
Yes _____  
No _____  
If no, please specify _________________________________________________
Q8. Do you feel that the topics in craft theory is suitable material for a learning resource CD?
Yes _____  No _____
If no, please specify ________________________________

Q9. Do you believe that having the learning resource available on a CD is of benefit to the students?
Yes _____  No _____  Unsure___

Q10. Do you think having class notes available outside of class would affect class attendance?
Yes _____  No _____  Unsure___

Q11. Would you think that the learning resource could be used to carry out course assessments?
Yes _____  No _____  Unsure___

Q12. If there were more topics in craft theory available on CD do you believe it would improve student learning?
Yes _____  No _____

Q14. How would you rate your current computer ability?
Poor______________________  Fair______________________  Good______________________  Excellent__________________

Q15. How did you acquire your current level of knowledge of ICT?
Self taught______________________  In-service Course________________  Doing a course on own initiative___  Never received training___________

Q16. When did you receive your ICT training?
In the last year___________  Two years________________  Three years ______________  Other___________________

If other, please specify ________________________________
Q17. Do you believe more training is required on the use and implementation of ICT in the class room?

Yes _____ □
No _____ □

Please feel free to add any additional information or comments, which you feel may be relevant.

_____________________________________________________________________
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Appendix J
Staff Questionnaire Findings

Q1. Do you believe that the learning resource software could be used successfully for teaching apprentice students craft theory?
   100% - Yes

Q2. Would you consider using a software learning resource instead of your current method of teaching?
   100% - No

Q3. From the given list, which would you choose as been appropriate for using the learning resource software?
   0% - Replace face to face teaching
   0% - Use as a standalone program
   100% - Enhancement to using existing notes

Q4. Do you believe that the learning resource would enhance the students learning experience?
   60% - Yes
   10% - No
   30% - Unsure

Q5. Do you feel the software would impede the students learning in any way?
   0% - Yes
   100% - No

Q6. What level of understanding of a topic do you feel the students would received by using the software before being taught using the traditional method?
   0% - No Change
   100% - Deeper level

Q7. For the time it takes to create learning resource software CD, do you believe it would be worth the time and effort?
   50% - Yes
   50% - No

Q8. Do you feel that the topics in craft theory is suitable material for a learning resource CD?
   80% - Yes
   20% - No

Q9. Do you believe that having the learning resource available on a CD is of benefit to the students?
   70% - Yes
   0% - No
   30% - Unsure
Q10. Do you think having class notes available outside of class would affect class attendance?
60% - Yes
10% - No
30% - Unsure

Q11. Would you think that the learning resource could be used to carry out course assessments?
55% - Yes
0% - No
45% - Unsure

Q12. If there were more topics in craft theory available on CD do you believe it would improve student learning?
80% - Yes
20% - No

Q14. How would you rate your current computer ability?
11% - Poor
34% - Fair
40% - Good
15% - Excellent

Q15. How did you acquire your current level of knowledge of ICT?
45% - Self taught
5% - In-service Course
40% - Doing a course on own initiative
10% - Never received training

Q16. When did you receive your ICT training?
10% - In the last year
10% - Two years
40% - Three years
40% - Other

Q17. Do you believe more training is required on the use and implementation of ICT in the classroom?
40% - Yes
60% - No
Appendix K

Domain Reference test

Q1.  What was the percentage of Timber frame house completions in Ireland for the year 2005.
A- 15%  
B- 20%  
C- 25%  
Answer: [ ]

Q2.  Which type of Timber frame construction is most used in Ireland.
A- Platform Frame  
B- Balloon Frame  
C- Volumetric  
Answer: [ ]

Q3.  From the picture below name the type of timber frame construction
A- Balloon Frame  
B- Post and Beam  
C- Platform Frame  
Answer: [ ]

Q4.  What percentage of energy saving can an owner expect from a timber frame house.
A- 50%  
B- 60%  
C- 70%  
Answer: [ ]

Q5.  What is the breather membrane in an external wall of a timber frame building used for.
A- Prevent water from entering  
B- Insulate the building  
C- Provide the building with racking  
Answer: [ ]
Q6. Match the component name with the corresponding letter from the drawing shown

Breather membrane
Vapour barrier
Insulation

Q7. Name the cross section shown in the drawing

A- Mid floor
B- Internal wall
C- External wall

Q8. During the erection of a timber frame building. Name the component that is fixed to the foundations and the rising walls are then fixed too.

A- Stud
B- Sole Plate
C- Lintel

Q9. How many weeks does it usually take from pouring the foundations to completing the timber frame house.

A- 10 weeks
C- 20 weeks
B- 30 weeks

Q10. Is the roof of a timber frame building fixed to the

A- Outer leaf of the building.
B- Inner leaf of the building.
Appendix L

Sample Screen Prints of Learning resource software

Main Menu Page

Introduction page

Introduction page 2

Advantages- Build Efficiency

Advantages- Design Flexibility

Advantages- Energy Saving
Advantages - Sound Proofing

Timber Frame Construction
Why Timber Frame - Advantages

Sound Proofing
Timber frame buildings achieve high levels of acoustic performance that can be varied to suit individual client requirements. Most timber frame manufacturers provide standard acoustic insulation that meets or exceeds the Building Regulations requirements.

Upgrading of standard sound proofing at the construction stage is expensive and involves every corner, requiring additional cost. A timber frame build follows the principles of cavity wall construction, reducing noise transmission to the inside of the house.

Advantages - Speed

Timber Frame Construction
Why Timber Frame - Advantages

Speed
Due to the fact that most of the timber frame to factory manufactured, a timber frame house can be raised to a wind and weather tight stage within days of delivery on site.

The timber frame walls are ready to accept internal wall finishes, etc, without waiting for any external finishing work to be completed. The whole process can be completed within weeks, as opposed to months or years with traditional construction methods.

Advantages - Environmentally Friendly

Timber Frame Construction
Why Timber Frame - Advantages

Environmentally Friendly
Timber is a renewable, sustainable resource. All timber used in timber frame manufacture comes from sustainable sources. Many manufacturers have sustainable policies and programs to ensure responsible sourcing.

The building process in timber frame construction is smaller and more controlled, resulting in less waste and pollution. A timber frame house is also better for the environment because less energy is used for space heating throughout the life of the house.

Types of construction

Platform Frame construction

Volumetric construction

Balloon Frame construction

Post and Beam construction

Platform Frame consists of platforms that are pre-fabricated in a factory, then erected on site. The walls and roof are in place within a few days, making it an efficient method of construction.

Volumetric construction involves the construction of a complete building volume in a factory, then transported to site and assembled. This method is ideal for large commercial and industrial projects.

Balloon Frame construction uses timber frame walls and floors, with a timber frame roof truss system. It is suitable for both industrial and residential projects.

Post and Beam construction consists of post and beam structures, with the beams supporting the roof and the posts providing support for the walls. This method is ideal for traditional design and is commonly used in residential construction.