

An exploratory study of the perception of guidance counsellors regarding the challenges in encouraging female students to opt for STEM (Science, Technology, Engineering and Mathematics) subjects at post primary level

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Declaration

The author hereby declares that this thesis is entirely her own work.

No element of the work described in this dissertation has been previously submitted for any degree in the University of Limerick, or in any other institution.

Signature: _____

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Abstract

The overall aim of this research study was to develop understanding of guidance counsellors' role in guiding females to study STEM (Science, Technology, Engineering and Mathematics) subjects. The study explored guidance counsellors' perception of STEM and its impact on subject choice. The influence of gender and parents on subject choice were also investigated.

A qualitative approach was used in this research study. Semi structured face to face interviews were used to collect primary data. Those interviewed were guidance counsellors working with female students in post primary education in the west of Ireland.

Four main themes identified in the primary data- The Guidance Counsellor's Perception of STEM, Gender Stereotyping, The Influence of Parents as Perceived by Guidance Counsellors and The Influence of Gender, Culture and Society.

A number of recommendations are proposed based on these findings in the areas of practice, policy and future research. Recommendations include that policy makers should reflect on the needs of all-girls schools and STEM subject provision, that awareness of gender stereotyping be built into teacher education programmes and guidance counsellor CPD and that further research should be done into the influence of parents on children with regards to subject and career choice.

Chapter 1: Introduction

1.0 Introduction

This research outlines the experience of six guidance counselors and their perceptions regarding the challenges in encouraging female students to opt for STEM subjects at post primary level. The aim of the study was to develop understanding of guidance counsellors' role in influencing females to study STEM subjects. The investigation intends to advance insight into their influences on female students regarding this decision. The research is completed through an interview format.

The subsequent sections present the context of the research, the justification for the study and the position of the researcher. The aims and objectives, methodology and plan are also discussed.

1.1 Context and Justification

Of late there has been an emphasis on the importance of encouraging education in Science, Technology, Engineering and Mathematics (STEM), (Science Foundation Ireland, 2012). STEM is believed to be essential for the future as it is 'necessary to drive our economic ambitions, support innovation and provide the foundations for future prosperity', (The STEM Education Review Group, 2016, pg.3). As Ireland is a knowledge based economy the country is dependent on the quantity and quality of STEM graduates. The need for workers qualified in STEM is expected to increase, (Access, 2017). Opportunities are thought to be boundless in these areas, (DeNisco, 2016). Graduates of STEM are in high demand and due to this STEM occupations can be well paid and have opportunities for progression. As such STEM can be seen to empower those who study and are employed in such fields, (Learning & Skills Bulletin, 2017).

However there are 'too few females enrolling and persisting in collegiate STEM degree programs', (Edzie, 2015). Women are underrepresented in STEM professions and leadership positions, (Gorman et al, 2010). Women are therefore missing out on the opportunities presented by STEM and the underrepresentation of women can advance the gender pay gap.

IBEC (2017, pg.2) explain that despite the fact that Ireland ‘has seen significant progress socially and economically over the last number of decades’... there is ‘more work to be done if we are to achieve a diverse and inclusive Ireland where every citizen can achieve their full potential and enjoy a safe and fulfilling life, irrespective of their gender’.

There are noteworthy gender differences in Ireland in the selection of STEM subjects in secondary schools. The ratio of female to male students for physics is 1:3 for example, (State Examinations Commission, 2018). The percentage of women in STEM careers is less than 25 per cent, (The STEM Education Review Group, 2016, pg.8).

There have been some attempts through policy to address this issue. For example the White Paper in Education necessitates that a technology or science subjects be required for all Junior Cert Students, (Department of Education and Science 1995). Likewise the Action Plan for Jobs 2012 included objectives around STEM at primary and secondary level, (Department Jobs, Enterprise and Innovation 2012). This included increased points at leaving cert for those who passed higher level mathematics. In the Action Plan for Jobs 2018, there is an appeal for partnerships between teachers, guidance counsellors and industry to improve the interest in STEM in female students, (Department of Jobs, Enterprise and Innovation 2018).

The role of the guidance counsellor is to ‘engage in personal, educational, and vocational counselling with clients throughout the lifespan, in the particular circumstances of their life’, (IGC, 2010, pg.3). There is a focus currently on employability and ‘work readiness’ of students as the education sector endeavours to become more responsive to the developing needs of the labour market, (Department of Education and Skills, 2011). Hillage and Pollard (1998, p. 2) explain that ‘employability is about being capable of getting and keeping fulfilling work’. Employability is about students being able to move within the labour market self-sufficiently to attain their goals. Guidance counsellors can have a positive influence on career self-efficacy regarding STEM and that through guidance there can be a ‘positive impact...and, hopefully, increasing the flow of more diverse students into the postsecondary STEM pipeline’, (Falco, 2017, pg.365).

1.2 The Researcher's Position

Bourke (2014, pg.1) recommends that researchers 'carefully consider the potential influence of their positionality in any research setting'. I worked in Human Resources in a medical device manufacturer during completion of this research. My two previous roles were likewise in Human Resources in medical device manufacturers in the west of Ireland. I initially studied a Bachelor of Arts followed by a Higher Diploma in Business Studies. I later completed a Masters in Human Resources and Industrial Relations.

My curiosity regarding STEM was raised during my work in the medical device industry. Many of those I support work are in Science, Technology and Engineering careers. Through my work with these groups I became interested in the fact that women were underrepresented in all of these areas- across the companies I had worked in. I also became conscious that engineering and technology subjects were not options for me to consider during my post primary education in an all-girls school in the west of Ireland. On reflection I never considered technology or engineers as career options and that may have been because those subjects were not offered to me at post primary level. I am interested in gaining insight from guidance counsellors who are positioned to raise awareness of STEM in their roles and work.

1.3 Research Methodology

An interpretivist qualitative approach is taken in this research. The research considers the experience of six guidance counsellors in post primary education and their perception of the challenges in encouraging female students to partake in STEM subjects. Semi structured face to face interviews were undertaken for the design frame. Interviewing allowed for the collection of subjective, in depth and detailed data, (Blaxter, 2010). After the data was collected a thematic analysis approach was taken to analyse the data, (Attride-Stirling, 2001).

1.4 Aims and Objectives of the Research

The main aim of the study was to develop understanding of guidance counsellors' role in influencing females to study STEM subjects

The objectives of the study were:

1. To examine guidance counsellors' perception of STEM subjects as subject choices
2. To investigate the influence of gender on STEM subject choice from guidance counsellors' standpoint
3. To examine parental influence on female students in choosing STEM subjects as perceived by guidance counsellors

The aim and objectives are further elaborated in the Methodology chapter.

1.5 Thesis Plan

Following is the structure of the research:

Chapter 1: The Introduction chapter presents the study as well as discussing the context of the study, justification for the research and the researcher's position. The methodology, aims and objectives and research plan are also outlined.

Chapter 2: The Literature Review offers an appraisal of literature regarding STEM from various sources. The role of the guidance counsellor is reviewed. An assessment of policy, research and literature in the field of STEM in the context of guidance and subject choice are explored. Key questions were unearthed.

Chapter 3: The Methodology chapter introduces the research design and the practical and philosophical approaches used. Research questions are discussed as well as the selection of the research paradigm. Data collection and analysis is explained. Reliability, validity, reflexivity and ethics are also presented.

Chapter 4: The Data Analysis and Findings chapter examines the findings from the primary data (semi structured interviews). Four main themes arose through thematic analysis. Relevant quotations are included to explain the experience of the guidance counsellors interviewed.

Chapter 5: The Discussion chapter puts forward the researcher's interpretation of the evaluated data using the framework of the literature review.

Chapter 6: The last chapter includes an assessment of the aims and objectives of the research as well as an outline of the findings. The conclusion proposes recommendations against a backdrop of practice and policy.

1.6 Conclusion

The Introduction chapter has introduced the topic of the research, the justification and context, the researcher's position and the aims and objectives of the study. The following chapter will discuss the findings of the literature review.

Chapter 2: Literature Review

2.0 Introduction

The Introduction chapter is comprised of an appraisal of the role of the guidance counsellor in post primary education. Irish government policy that affects guidance- particularly in relation of STEM- is examined. Theory in relation to STEM is reviewed. Gender stereotyping in the context of career choice is considered as well as career theory.

2.1 The Role of the Guidance Counsellor & Guidance Policy in Irish Post Primary Education

The Institute of Guidance Counsellors describe the role of the Guidance Counsellor as to ‘engage in personal, educational, and vocational counselling with clients throughout the lifespan, in the particular circumstances of their life’, (IGC, 2010, pg.3).

The Institute describes seven fields of professional practice as per the below, (IGC, 2010, pg.7):

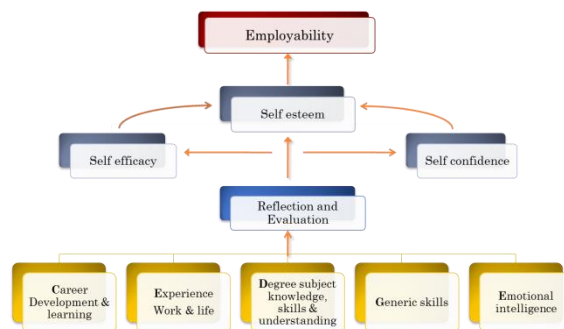


A Guidance Counsellor should have the competency to enable choices through the lifespan including personal life and career. The NGF describes guidance as the ‘process of facilitating individuals or groups at any point throughout their lives to develop their capacity for self-management of their personal, social, educational, training, occupational and life choices in order to grow towards their potential’, (National Guidance Forum 2007, pg.8).

In this case the Guidance Counsellors involved in this study work with young people in a post primary setting. In addition to the competencies described Guidance Counsellors should have the ability to facilitate ‘colleagues in implementing appropriate aspects of guidance programme within the curriculum’, (IGC, 2010, pg.8). This research will focus on subject choice which relates to the Guidance Counsellor facilitating educational choice. As well as guiding students in educational or subject choice guidance professionals must be conscious of assisting with decision making and improving self-awareness and self-esteem

In guidance settings currently there is a focus on employability and ‘work readiness’ of students as the education sector endeavours to become more responsive to the developing needs of the labour market, (Department of Education and Skills, 2011). It is key to note that ‘there is so much more to employability than gaining employment’, (Dacre-Pool et al., 2007, pg.228). Hillage and Pollard (1998, p. 2) explain that ‘employability is about being capable of getting and keeping fulfilling work’. Employability is about students being able to move within the labour market self-sufficiently to attain their goals.

Dacre-Pool et al. (2007,pg.227) use their Career Edge Model which intends to be practical while also doing ‘justice to this multifaceted issue’.



With regards to policy and post primary education the following are significant:

- The Green Paper on Education (Department of Education and Science 1992)
- The White Paper on Education (Department of Education and Science 1995)
- Education Act (1998)

The Green Paper underscored the importance of the whole school approach from a guidance perspective, (Department of Education and Science 1992). The White Paper emphasised a holistic approach to guidance. There was a recommendation to consider a ‘range of related processes...to support the personal, educational and vocational guidance of students towards the realisation of their full potential, (Department of Education and Science 1995, pg.64). The Education Act (1998) defined the two major requirements of post primary schools- ‘the need to provide access as determined by the general resources available in the school and the additional resource allocation for guidance and counselling’ and ‘the need to provide appropriate guidance’, (Department of Education and Science 1998, pg.4).

The Irish government’s budget in 2012 made changes to the provision of guidance in the post primary setting. A requirement was introduced to ‘manage guidance from within the standard allocation’, (Department of Education and Skills, 2012, pg.1). Ex-quota guidance posts were no longer given in schools. As a result the Institute of Guidance Counsellors reported that the budget cuts ‘entrenched the privilege of those who are already privileged, and undermine the prospects of those from less advantaged backgrounds in achieving their potential’, (IGC, 2016, pg.1) The NCGE (National Centre for Guidance in Education) stated that there had been a 25% decrease in guidance hours in post primary schools in Ireland, (National Centre for Guidance in Education, 2013).

STEM- as per the below- has been identified as an area with the potential to offer opportunities and financial gain. This has implications for guidance counsellors at post primary level in Ireland. Some authors explain that guidance counsellors can have a positive influence on career self-efficacy regarding STEM and that through guidance there can be a ‘positive impact...and, hopefully, increasing the flow of more diverse students into the postsecondary STEM pipeline’, (Falco, 2017, pg.365). STEM subjects however ‘are widely

perceived by ... career guidance counsellors as being difficult, and not relevant to many young people's lives', (The STEM Education Review Group, 2016, pg.43).

2.2 STEM Career Choice Research as it Relates to Female Students

In recent times, governments of developed countries have emphasised the importance of cultivating education in STEM, (Science Foundation Ireland, 2012). STEM is thought to be critical for the future as it is 'necessary to drive our economic ambitions, support innovation and provide the foundations for future prosperity', (The STEM Education Review Group, 2016, pg.3). Ireland is a knowledge based economy seeking to be a centre of technology and innovation. The country is therefore dependent on the quantity and quality of STEM graduates.

The requirement for workers qualified in STEM is expected to increase, (Access, 2017). Opportunities are thought to be boundless in these areas, (DeNisco, 2016). Those graduating in STEM fields are in high demand and due to this STEM roles can be well paid and have opportunities for progression. As such, STEM can be seen to empower those who study and are employed in such fields, (Learning & Skills Bulletin, 2017).

However, there is concern worldwide due to the fact that there are 'too few females enrolling and persisting in collegiate STEM degree programs', (Edzie, 2015). Women are also underrepresented in STEM professions and leadership positions, (Gorman et al, 2010). In the United Kingdom disparities between genders are growing with 19% of jobs in science being held by females, (Kirkup et al., 2010). As a result women are missing out on the opportunities presented by STEM and the underrepresentation of women can advance the gender pay gap. IBEC (2017, pg.2) explain that despite the fact that Ireland 'has seen significant progress socially and economically over the last number of decades' ... there is 'more work to be done if we are to achieve a diverse and inclusive Ireland where every citizen can achieve their full potential and enjoy a safe and fulfilling life, irrespective of their gender'. Therefore the underrepresentation of women in STEM could affect Ireland's competitiveness and economic growth (as 60% of graduates from university are women) but it is also an equality issue, (Accenture, 2014).

There are noteworthy gender differences in Ireland in the selection of STEM subjects in secondary schools. The ratio of female to male students for physics is 1:3 for example, (State Examinations Commission, 2018). The percentage of women in STEM careers is less than 25%, (The STEM Education Review Group, 2016, pg.8). Leaving certificate results in 2018 showed that of the eleven STEM leaving certificate subjects, nine had a gender imbalance in favour of boys, (State Examinations Commission, 2018). Cronin (2013) explained that subject take-up is influenced by provision of the subject, the manner of allocation within schools and the choice of individual students. Provision is of particular influence in all-girls schools in Ireland which often do not offer more technical STEM subjects, (Cronin, 2013).

IBEC (2017, pg.2) contends that the origins of segregation in subject and degree choice can be found in our culture and our education system which socialises young people into an ‘expectation of certain roles as women’s work or men’s work, beliefs which can be reinforced consciously or unconsciously by teachers, parents, employers and society’. Parson (2017, pg.7) describes a difficult path for female students that are at a ‘persistent disadvantage’ which is ‘systemically embedded in Science, Technology, Engineering, and Math (STEM) education in postsecondary institutions’.

An ongoing issue facing the female population are attitudes and stereotypes towards women and men. This contributes to segregation which can limit employment choices, admittance to higher level jobs and enabling the undervaluation of female led occupations. This segregation in the workforce is linked to segregation in education where stereotypes can be reinforced and the directing of students into certain subject selections in single gender schools for instance. This can later encourage the uptake of certain subject choices, fields of study and career choices, (Science Foundation Ireland, 2012). A report by Accenture found significant barriers in the secondary school system including the existence of negative stereotyping that STEM careers and subjects are more suitable for males, (Accenture, 2014). An obstacle for female students can also be that parents are major influencers on their daughters’ career paths and lack the necessary information regarding options, (Learning & Skills Bulletin, 2017). STEM subjects are not ‘generally part of the culture of either girls or indeed girls’ schools’, (Cronin, 2013, pg.1).

When asked in one study completed by Accenture (2013, pg.6) ‘Why do you think girls are considered the minority in Science, Technology, Engineering and Maths in school and work?’, female students answered:

- They were scared of being the only girl in the class
- Sub-standard career guidance
- Peer influence
- Perception that STEM is more suited to males
- Lack of information regarding career options

When parents and teachers were asked the same question their answers were similar but included ‘Promotion of stereotypical “girl career paths” (e.g. nursing, teaching)’ and lack of female STEM role models as further issues, Accenture (2013, pg.6). Parents were highlighted as a major barrier due to the fact that they were the biggest influencers regarding subject choice but also lacking in information and of the opinion that the most important aspect of the leaving certificate was getting maximum points. Guidance counsellors in educational settings could be seen to be ‘lacking in bridging the knowledge gap for career choices and new perspectives for boys and girls, (IBEC, 2017, pg.2). There is also a disconnect between subject choice in leaving certificate and the needs of the STEM industry. Furthermore there is disjointed information around STEM careers which makes it difficult to assess options. One review by the Institute of Engineering and Technology found that there is a perception that STEM subjects are difficult. The same study highlighted negative opinions regarding STEM and career opportunities on STEM. Lastly there was a stressing for the necessity of having quality teaching in STEM subjects, (Institute of Engineering and Technology 2008).

There is a necessity by all influencers of female children including guidance counsellors to ‘challenge occupational stereotypes by encouraging more women into male dominated industries and investing in careers advice that provides real information and options to students’, (IBEC, 2017, pg.2). Awareness of gender stereotyping should be built into the education of teaching. STEM subjects should be open to all girls which could open their awareness to wide-ranging careers. Effective career guidance is required as well as access to role models and work placements.

Sharkawy (2015) recommends giving girls access to resources and experiences that show ‘inclusiveness and bridges that allow admission... females can recognise STEM as having potential for themselves’. This could be done through the introduction of girls to female role models in STEM roles, workshops, guest speakers and internships, (Learning & Skills Bulletin, 2017). Guardians likewise play a role in support, guidance and confidence building so that their daughters feel empowered in their choice of career. Establishments in higher education some argue should maintain environments that support females in STEM by presenting real-life applications in courses as well as giving support through standards for achievement in the classroom, (Learning & Skills Bulletin, 2017). Further initiatives include outreach programmes to reinforce the STEM education and workforce pipelines, (Gorman et al, 2010). Mentoring is seen as essential to build female leaders and successful STEM programmes.

Research into this area has been considered from a gender, race and socioeconomic status point of view, (Metcalf 2010). Other research has looked at the recruitment of females to STEM roles and fields or on methods of making women more successful in those roles. Parson (2017, pg.7) contends that in order for women to feel welcome studying STEM and ‘challenge the existing social and scientific systems, it is necessary to explore and understand the social and political implications embedded within teaching and learning choices’.

A UK based questionnaire completed by 594 children at three ages- eight, twelve and sixteen explored stereotyping regarding gender roles and occupations. The older children held significantly less stereotyped views concerning which genders in their opinion should perform which roles. In the older group boys ‘sex-typed appropriateness of occupations to a significantly greater degree than girls’, (Miller & Budd, 2006, pg.17). The study found no ‘consistent or stable pattern of preference’ for genders regarding subject choice which the authors argued suggested show that ‘gender stereotyping of school subjects is weakening’, (Miller & Budd, 2006, pg.17).

2.2.1 Irish Government Policy Regarding STEM

STEM has been raised in government policy on several occasions such as the Action Plan for Jobs published every year from 2012 to 2018, (Department of Jobs, Enterprise and Innovation 2018). STEM has been highlighted as important for economic success and career opportunities. Through the Action Plan for Jobs sanctions have been made for the promotion of STEM in post primary and third level education. This includes bursaries introduced for certain STEM degrees at third level and additional points for those undertaking higher level mathematics at leaving certificate.

The STEM Education Policy Statement 2017-2026 outlines the aim of Ireland becoming the ‘best education and training service in Europe by 2026’ with STEM at the heart of this objective, (Department of Education and Skills, 2017, pg.2). The policy includes a section on post primary education as well as third further and higher education, the business community, families and out of school programmes. Gender is specifically called out in the objective to increase participation of learners in STEM education.

2.3 Gender Stereotyping and Career Choice

Gender stereotypes are generalized ‘socially shared beliefs that certain qualities can be assigned to individuals, based on their membership in the female or male half of the human race’, (Lips, 1988, pg.2). Eccles (1994) examines how one’s opinion with regards to career is influenced through socialization. Parents, guidance counsellors and teachers can influence a child’s perception of choice through experiences and information they provide. Eccles also found that there were differences in the value males or females attached to options. Females were less likely to choose a higher level of mathematics for instance as they thought it to be less important than their male counterparts.

A study conducted by McMaster (2017, pg.528) noted disparities in the uptake of STEM subjects because of ‘students’ family background, gender and ethnicity’. The reasons that were proposed for the lack of uptake included ‘students’ values, perceptions of the importance and relevance of STEM, shortages of mathematics and science teachers, perceptions that

STEM subjects are more difficult or 'boring' compared with other subjects, and teaching methods and styles, (McMaster, 2017, pg.528). McMaster (2017, pg.531) explained that while 'inequality in participation by students' family background, prior attainment cannot explain disparities by gender'.

There was previously an argument that the gender disparities in subject or career choice were caused by differences in ability but this has been disproved for the most part, (Linn & Hyde, 1989). Most research now accepts that male and females have similar abilities, (Hyde, 2005). In the UK for instance females at post primary level perform better than their male counterparts in most subjects. Accomplishments are similar in mathematics and science. However at university level the greatest predictor for applications for mathematics is gender, (Noyes, 2009). Some propose that females are less likely to opt for STEM subjects because they attain high grades in other subjects and consequently have greater choice. A study done by Wang et al. (2013) for example showed that female participants who had high verbal and mathematics scores were less likely to work in STEM than students with average verbal and high mathematics scores. Wang et al. (2013) considered therefore whether ability in English had negative connotations with the uptake of mathematics and science.

McMaster (2017) also observed interactions between students' ethnicity and gender and student's social background and gender. Female students from more prosperous backgrounds for example are more likely to choose to study STEM subjects. Females from less prosperous backgrounds 'may be more likely to feel constrained by their gender and to feel that they have less control over their future, which may in turn be related to uptake', (McMaster, 20017, pg.548). This may show that female students from 'deprived backgrounds may be particularly vulnerable to factors driving students away from STEM', (McMaster, 20017, pg.548).

Guardians' behaviours and attitudes may also have an effect. If for example a mother with a higher level of education have a more uncensored democratic view of gender roles this may have an influence of her children in choosing subjects, (Kulik, 2002; Antill et al., 2003). Antill et al (2003) contested that children were more egalitarian when their parents encouraged cross sex interests and behaviours and the less they encouraged same sex ones. For example the less feminine household tasks such as cleaning and cooking that mothers performed, the more egalitarian their daughters were. This is because such tasks 'clearly distinguished the

egalitarians from the others', (Antill et al, 2003, pg.150). Egalitarianism is therefore an ideology for families that has significant impact. It should be noted however that there is an absence of data to prove this. Antill et al (2003, pg.151) suggested that based on their religiosity, education and politics parents 'home environments that perpetuate their values in their children even beyond their own measured attitudes and socialisation practices'.

McQuaid and Bond (2004, pg.6) found that the primary reason a student chose a subject was 'enjoyment, and to a lesser extent, interest and being good at a subject'. Some students picked subjects because they felt they would be beneficial for what they aimed to study in the future. McQuaid and Bond (2004) also found that the reasons for choosing certain subjects was alike for both girls and boys. When students were surveyed, certain jobs 'remained persistently gender stereotyped', (McQuaid and Bond, 2004, pg.7). However females were 'significantly less stereotyping of jobs and occupations than boys', (McQuaid & Bond, 2004, pg.7). Stereotyping of jobs due to gender was also linked to students' levels of achievement. McQuaid and Bond's study found that family and ethnic background were not highly related to gender stereotyping. Generally students believe that one gender is better suited for a job is because they associate particular characteristics with either females or males.

It was found that the student's job preferences for themselves were often traditional. While females felt that 'they were suited to work in some previously male-dominated professions', it was uncommon for girls to think that they were suited to the occupation of engineer (10% of girls versus 63% of boys), (McQuaid & Bond, 2004, pg.8). The aspects of the job boys and girls rated as important varied greatly- for example helping people. There was also an inclination for both sexes against working in jobs that were traditionally associated with the opposite sex. Approximately 68% of students knew someone who had the student's chosen job. Female students who felt that both genders were suitable to gain traditionally male occupations were more likely to feel that they themselves were suited to that job. Parents- and in particular mothers- were seen as an important influence in their children's careers. Mothers were important for both but especially for girls. Fathers were seen as important for their sons. 'Informal' networks of advice are more important than 'formal' ones, which raises issues about the accuracy of such advice', (McQuaid & Bond, 2004, pg.10).

Spencer et al (1999) describe stereotype threat where an individual can have anxiety when there is a possibility of confirming a stereotype regarding their social group. Deemer et al's (2013, pg.) study is based on Lent et al.'s SSCT and reviewed the impression of stereotype threat 'as a particular type of contextual barrier to women's STEM career development'. Low self-efficacy has been identified as a significant reason why females are underrepresented in STEM. Deemer et al (2013, pg.) found that 'stereotype threat in the laboratory classroom triggers specific and differential effects for women considering chemistry and physics careers'.

Bandura et al (2001) established 'support for the posited causal structure through which socioeconomic, familial, academic, and self-referent influences operate in concert to shape children's career trajectories'. One study found evidence that females perceive 'cues in sexist men's behaviour that they could be devalued and are at risk of being viewed through the lens of a negative gender stereotype (Logel et al, 2009, pg.1100).

2.4 Career Theory as it Relates to Female Students and Career Choice

Traditional career theory comes from development and differential psychology such as Super and Holland. It could be argued that these theories are insufficient in explaining females' careers as they are based on studies of males and therefore men's career development. Bimrose (2001) claims that a further weakness is that they separate the person from the context in which they exist. There are theories however which aim to include structural areas into career decision making such as gender, ethnicity and class. Two such theories are Gottfredson's Circumscription and Compromise (1981) and Self Efficacy (Hackett and Betz, 1981).

Gottfredson (2005) proposed a theory- Circumscription and Compromise- to describe how adolescents develop career choice. Occupations are influenced by sex type, prestige level and field of work .The theory first reviews the progress of an individual's assessment of the choices available. The stages proposed are sex roles, orientation to- size and power, social values and internal unique self. At the following Compromise stage the individual may be 'inclined to sacrifice roles they see as more compatible with their self-concept in favour of

those that are perceived to be more easily accessible', (Gottfredson, 2005, pg.5). Individuals can be limited on occasion by a lack of knowledge regarding how to 'access certain roles because of lack of information, lack of know-how and appropriate tactics, and lack of helpful social connections', (Gottfredson, 2005, pg.5).

Self-efficacy also has the potential to further learning with regards to career choice/ theory and women. Bandura describes self-efficacy as a person's 'judgement of their ability to carry out actions in order to reach their goals, (Barnes et al., 2004, pg.16). Adolescents with low self-efficacy can experience high levels of anxiety and lack necessary support and modelling from others, (Kidd, 2006). Those with a high degree of self-efficacy are usually confident in their abilities to organise themselves and carry out activities necessary to achieve their goals, (Betz, 2000). The opinions a person has about their own capabilities can affect their behaviours. The experiences a child for instance has socially can limit their participation in certain activities. Girls are often encouraged into more caring activities whereas boys may be more allowed to partake in practical or messy activities. Differential self-efficacy is grounded in gender, ethnicity and social class. Women and men have higher self-efficacy in occupations where their gender dominates. Women and men therefore drift towards studies and jobs that are dominated by their own gender. Educational choices are pointedly influenced by environmental factors and should therefore be considered in the context of an individual's social experiences (Anderson, 1998). Socialisation and labour market contexts are important when considering women and career theory.

Socialisation is described by Coleman (1992, pg.5) as the process whereby 'individuals in a society absorb the values, standards, and beliefs current in that society. This concept is significant in the construction of gender role identities. Socialisation agents can include peers, parents, school and the media. As a child, one's role is assigned by others. As an adolescent one's role widens. Adolescence is a period of transition, choice and a time where one is sensitive to the evaluation of others. Archer (1992) describes gender identity both a product and a process. Gender identity is formed through reinforcement. Children learn what is conventional from responses of parents, peers etc. to behaviour. Children also observe behaviour and copy behaviour of others especially of the same gender (Archer, 1992).

Inkson et al. (2015) claimed that there are inheritances concerning careers that we are born with such as our sex, race and genetic makeup. Others such as 'values, motivation, and education, are developed in childhood largely as a result of family influences and become part of what we bring a career', (Inkson, 2007, pg.28). Inkson et al. (2015) also noted that career inheritances may have influence on the education and wealth you need to obtain certain opportunities.

Social Learning Theory identifies the interactions of genetic factors, environmental conditions, learning experiences and performance skills and emotional and cognitive responses that produce drive along a particular career path, (Krumboltz et al., 1976). The theory attempted to show 'how educational and occupational preferences and skills are acquired and how selections of courses, occupations and fields of work are made', (Krumboltz et al., 1976, pg.71).

Krumboltz et al. (1976) explained that CDM (Career Decision Making) is influenced by four categories- environmental conditions and events, genetic endowment and special abilities, learning experiences and task approach skills (e.g. goal setting self-observation and information seeking). Genetic influences are relevant in this case as to whether a student has emotional and/or financial support from their parents. From an environmental point of view it would be helpful to acknowledge for example the economic strength in the country at the time of CDM. An individual making career decisions during an economic boom, in a developed country with supportive parents will have greater educational opportunities.

The Planned Happenstance Theory proposes that 'traditional career counselling interventions are no longer sufficient to prepare clients to respond to career uncertainties' and that chance plays a significant role in an individual's career, (Mitchell et al., 1999, pg.155). Unplanned events can encourage individuals to 'take actions to open up opportunities even when they don't know the outcomes', (Krumboltz & Levin, 2004, pg.5). This is relevant from the point of view of the research in that individuals should be open and aware of new industries and experiences. Individuals may learn to take advantage of happenstance and 'how to apply this knowledge to whatever circumstance life brings', (Krumboltz & Levin, 2004, pg.21).

Parson proposed a 'fit' model of which the first two steps assess the self and the context. Step three includes using 'true reasoning to make choices based on the comparison' or reasoning rooted in rationality, (Inkson, 2007, pg.108). The understanding is that if an individual can assess a job and themselves in terms of good fit then 'following work adjustment theory, you are able to predict satisfaction and satisfactoriness', (Inkson, 2007, pg.108). However, 'rational decision making depends on a number of conditions that are unlikely to exist', (Inkson, 2007, pg.108). Some contend that Parson's model is an ideal. It may be difficult to predict satisfaction levels when taking a risk choosing a different subject, course or industry.

Super's theory of career development proposes four stages of adult career development: exploration, establishment, maintenance, and disengagement, (Smart & Peterson, 1997). Super contended that the 'timing of transitions between career stages was more a function of the individual's personality and life circumstances than of chronological age', (Smart & Peterson, 1997, pg.359). Those choosing subjects at post primary level for instance may be imagined as not yet having passed through the exploration phase as they are still in the process of studying and discovering. It is possible that if one changes career or subjects of study later that one could move through stages multiple times with 'subsequent passages arising at ages well above the traditional norm', (Smart & Peterson, 1997, pg.359). However this does not mean that career development would be more difficult or that the conclusion would be less positive.

2.5 Conclusion

The Literature Review chapter considered the role of the guidance counsellor in post primary education as well as guidance policy in secondary education. Policy regarding STEM was examined as well as career theory concerning STEM. Career development theories such as Circumscription and Compromise, Self-efficacy and Socialisation were scrutinized. Gender stereotyping in the context of career choice was also reflected upon.

Chapter 3: Methodology

3.0 Introduction

The methodology chapter outlines the practical and philosophical approaches of the research project. The research questions as well as the paradigm used are outlined and developed. Sampling, data collection and data analysis are defined. Potential ethical issues, validity and reliability are discussed. Research ‘should be as open and transparent as possible in terms of its intentions, methodology, analysis and findings’, (Blaxter et al., 2010, pg.16). The research should be ethical, in-depth and impartial.

The title of this research is, ‘An exploratory study of the perception of guidance counsellors regarding the challenges in encouraging female students to opt for STEM (Science, Technology, Engineering and Mathematics) subjects at post primary level’. The aim is to develop understanding of guidance counsellors’ role in influencing females to study STEM subjects. Research into this area has been considered from a gender, race and socioeconomic status point of view, (Metcalf 2010). Much of the focus however in increasing female representation in STEM is on how industry can increase the recruitment of females in these male dominated areas, (Edzie, 2015). This is despite the fact that research claims that early influences on girls including guidance at school has a major impact on subject choice and later career choice. The percentage of women in STEM careers is less than 25 per cent, (The STEM Education Review Group, 2016).’

3.1 Identification of Research Questions

Initially in the research process the main research question was decided upon. Jones (2003, pg.42) explains that ‘deciding on an answerable and relevant research question lies at the heart of all good research projects’. The origins of a research question can include literature, recognition of a gap in research or policy development, (Jones, 2003). After deliberation on literature on and reflection on the researchers work- which involves supporting colleagues in STEM fields- a primary research aim was decided upon. The researcher had an interest in

career decision making and was curious as to why according to literature female students seemed less likely to choose STEM subjects.

The chief research aim in this research project is:

‘To examine the perception of guidance counsellors regarding the challenges in encouraging female students to opt for STEM (Science, Technology, Engineering and Mathematics) subjects at post primary level’

The objectives are

1. To examine guidance counsellors’ perception of STEM subjects as part of subject choice
2. To investigate the influence of gender on STEM subject choice from guidance counsellors standpoint
3. To examine parental influence on female students in choosing STEM subjects as perceived by guidance counsellors

3.2 Selection of Research Paradigm: Qualitative Paradigm

Antwi & Kasim (2015, pg.218) describe a paradigm as ‘a conceptual framework shared by a community of scientists which provides them with a convenient model for examining problems and finding solutions’. This study will take an interpretivist approach. Interpretivism is subjective and focused on the generation of theory, (Flick, 2011). Positivism on the other hand is the paradigm which holds the ‘view that social science procedures should mirror, as near as possible, those of the natural sciences’, Blaxter (2010, pg.61). The goal is to give clarification leading to certainty. This type of research is objective and is quantitative. In research done on guidance there has been a reliance previously on the positivist approach,

(Reid & Bimrose, 2006). In more recent times there has been support for a greater use of the interpretivist paradigm, (Blaxter, 2010).

Interpretivism is a concept 'used to identify approaches to social science that share particular ontological and epistemological assumptions', (Lewis-Beck et al, 2004, pg.509). The dominant principle is that due to the fact that there is major difference between social and natural sciences, the approaches of the natural sciences are not appropriate to use in the social sciences. When studying social phenomena one needs to comprehend the social environments that individuals inhabit 'which they have already interpreted by the meanings they produce and reproduce as a necessary part of their everyday activities together', (Lewis-Beck et al, 2004, pg.509). When one studies natural phenomena on the other hand scientific concepts and theories are used for interpretation.

Interpretivism aims to be objective around the subjective- to produce 'verifiable knowledge of the meanings that constitute the social world', (Lewis-Beck et al, 2004, pg.510). Their attention focused on the essence of social action, this action's role in life and assessing the meaning of social action. Weber and Scutz who originally considered interpretivism proposed working at an advanced level of generality. They argued that social consistencies may be understood through the construction of models of characteristic meaning used by representative social individuals in typical circumstances. It was suggested that this would constitute hypotheses that could then be tested. One should use actions that are deliberately selected in, goal orientated and have a rational.

Weber proposed that there are three kinds of subjective meanings- the intended and actual meaning, the approximate meanings of social actors or the typical meanings of a hypothetical social actor. Weber (Lewis-Beck et al, 2004, pg.510) also noted three modes of understanding- 'rational understanding, which produced a clear intellectual group of social action in its context of meaning, and empathetic or appreciative understanding, which involves grasping the emotional content of the action- and the two versions of rational understanding, direct and motivational understanding'.

Weber contended that significant interpretations could be used plausibly as hypotheses. The author suggested using comparative research. However if that was not possible he

recommended that one should use ‘imaginary experiments’... ‘the thinking away of certain elements of a chain of motivation and working out the course of action that would probably then ensue’, (Lewis-Beck et al, 2004, pg.510). Interpretivism is not chiefly concerned with an individual’s own meaning but instead with the meaning of the ‘situation for a constructed hypothetical actor’, (Lewis-Beck et al, 2004, pg.510). It is also more concerned with approximations as opposed to specific meanings individuals give to their actions. Meaningful social relations are significant as well as the effect on behaviour. Weber was primarily concerned with significant uniformities, (Hammersley, 2017). Due to the fact that Weber did not want to limit himself to micro or contemporary situations he was required to work with the individual’s interpretations. He saw these as hypotheses that he could test. Schutz (1976) built on Weber’s work and proposed a method of ideal typing.

There have been criticisms of interpretivism from both those that use and do not use the approach. Giddens (1984) contended that it was not correct that individuals continually monitor their conduct and are not always aware of why they take an action or their intentions. He thought this happened when individuals thought back retrospectively to their actions. Rex (1974) argued that researchers in social science should be capable of offering a different opinion of an individual’s actions from what the individual themselves believe. Lewis-Beck et al (2004, pg.510) explained that Bhaskar (1979) spoke of this as ‘as linguistic fallacy, which is based on a failure to recognize that there is more to reality than is expressed in the language of social actors’. Others felt that interpretivism did not recognize the part of institutional arrangements, in particular relations of power and divisions of interest. As part of this approach semi structured interviews were undertaken to gain a deeper understanding of their perception of the challenges in encouraging female students to consider STEM subjects.

3.3 Research Framework: Semi Structured Interviews

The study design is based on qualitative methods of research. Interviews with guidance counsellors who are members of local IGC branches in the west of Ireland were included. The participants worked in post primary education. Candidates of both genders were included. When seeking participants those with a minimum of two years’ experience were asked to take

part. Interviewing involves ‘questioning or discussing issues with people’, (Blaxter, 2010 pg.193). Interviews will be used to gain data which would not be possible to access from quantitative methods such as surveying. See Appendix (E) for Interview Schedule/ Questions. The benefits of this approach were that interviewees had the opportunity to be more subjective. There were limitations however in the fact that interviews allowed access to a more limited or smaller group than for example questionnaires would have. There was also a greater potential for bias. Interviews were face to face and semi structured to create a safe climate for the exploration of relevant issues. They took place in local education centres. Interviews were audio recorded and transcribed after the sessions. The participants were Guidance Counsellors working with females at post primary level. Permission was sought from the chair of local IGC branch and the guidance counsellors themselves before interviewing began. Transcription and analysis of data began when interviews were underway. Thematic approach was applied to analyse the data.

When formulating interview questions it was ensured that questions being posed were clearly understood by participants and relevant. It was important that the layout of the questions being asked were clear and easy for the researcher and participant to follow. There was a need to ask enough questions to gather data but not too many with the result of participants becoming disinterested, (Cohen et al., 2011).

In order to gain the most from this method there was a need to be clear and open during the process to allow conversation to flow. One strength of using interview is the adaptability they allow- probing of answers can allow deeper insight into motives and feelings for instance, (Bell, 2005). Interviews however are more time consuming and more open to bias. Researchers should ensure to be sensitive when interviewing participants. Confidentiality must be paramount while conducting interviews. Interviewing is already intrusive- to have details about the participant revealed would be even more so, (Oliver, 2010).

Ethical approval permission was sought from the University of Limerick and granted before research commenced. Chairs of the IGC branches (Gatekeepers) were then contacted requesting that 6-10 of their members would volunteer to participate. The researcher distributed consent forms and information sheets to the Gatekeepers. When volunteers were identified consent forms and information sheets were provided to them also. Ten potential

participants were contacted in order to allow for fallout. This number was decided upon in order to generate a sufficient amount of data, (Mason, 2010). The interviewed took approximately forty minutes to complete. Six guidance counsellors were interviewed in total.

3.4 Methods of Data Collection and Analysis

This segment will explain the data collection method used in the research. Data collection involves sampling, getting access to volunteers, handling ethical issues and gathering and organising data (Patton, 2002). The data collection method used was a semi structured interview.

3.4.1 Access and Sampling

A purposive sample was used to invite potential candidates to volunteer for research. Seven volunteers offered to participate in the study. Six of the seven volunteers had the required two years' experience in guidance counsellor roles in a post primary setting. One of the seven volunteers was excluded from the sample as she was recently qualified and did not have the required level of experience. Consent to take part was obtained from the six volunteers. Six to ten volunteers had been decided as appropriate when gaining ethical consent. The selection criteria was therefore met in that there were six participants who were working as guidance counsellors with at least two years' experience in post primary schools in the west of Ireland.

3.4.2 Individual Semi-Structured Interview Approach

As the study was taking an interpretivist approach it was decided to collect data by means of semi structured interviews. Interviews were carried out with the six volunteers using pre-determined interview questions (Appendix E). Questions were asked in a linear manner where necessary but a fluid approach was taken at times in order to maintain a good flow during conversation.

3.4.3 Data Analysis

As the research was qualitative in nature and as semi structured interviews were used it was decided to make use of thematic analysis. Initially in thematic analysis data is collected, (Aronson, 1995). An audio recording device was used in this research to collect data. These recordings were then transcribed and the audio and written recordings checked several times. It was then attempted to draw patterns from the data using quotes and ideas that were common amongst the participants. Lastly the themes were matched to those found in the literature.

The below table illustrates Attride-Stirling's (2001) stages and steps in completing thematic analysis in the interpretivist paradigm.

<p>Stage A: Reduction of Text</p> <p>Step 1: Code material</p> <p>Step 2: Identify themes</p> <p>Step 3: Construct thematic networks</p> <p>Stage B: Exploration of Text</p> <p>Step 4: Describe and explore thematic networks</p> <p>Step 5: Summarise thematic networks</p> <p>Stage C: Integration of Exploration</p> <p>Step 6: Interpret patterns</p> <p style="text-align: right;">Source: Attride-Sterling (2001)</p>

Attride-Stirling (2001, pg.402) contends that 'by breaking up the text into clearly defined clusters of themes, the researcher is able to unravel the mass of textual data and make sense of others' sense-making, using more than intuition'. It is explained that using a tool to analyse data is important as 'if qualitative research is to yield meaningful and useful results, it is imperative that the material under scrutiny is analysed in a methodical manner', (Attride-Stirling, 2001, pg.386).

3.5 Validity and Reliability Issues

Whatever the method of data collection validity and reliability need to be considered.

Reliability is ‘the extent to which a test or procedure produces similar results under constant conditions on all occasions’, (Bell, 2005, pg.119). Questions asked should produce the same results when using the same conditions. Validity can be described as the ‘design of research to provide credible conclusions’, (Bell, 2005, pg.120). A researcher must assess validity for both measurement instruments and research design (Flick, 2011). With regards to research designs the emphasis is on the evaluation of results. It is necessary to check the internal validity of the design of the research. This may show to what length the results of the research can be analysed explicitly. Flick (2011, pg.265) explained that if a researcher wants to ‘study the effects of an intervention, *they* should check whether changes in the dependent variables can be traced to changes in the independent variable or whether they may results from changes in some other variable’. In order to evaluate internal validity one should attempt to eliminate other influences. The conditions should be controlled and isolated. So as to ensure reliability it is important to have an emphasis on procedures and understand as a researcher how one’s questions will produce data. Declarations by those participating in the interviews should be distinguished clearly from interpretations made by the researcher. The process should be documented thoroughly and in a reflexive manner. For instance one may wish to document and reflect on decisions made during the research. The researcher could show when decisions were made and why.

3.6 Researcher Reflexivity

McLeod (2015, pg.11) argued that ‘good therapy research requires paying attention to reflexivity, i.e. the personal meaning of the research to the researcher’. In particular in qualitative research the primary instrument of research is the individual doing the research. If one is doing quantitative research data may be collected through the use of surveys and questionnaires for example. Analysis may be completed through statistical procedures that are predetermined. The same is not possible when doing qualitative research.

When doing qualitative research the researcher exerts influence of some sort unavoidably. Those participating in interviews for instance can be more open to saying certain things to one researcher rather than another. The researcher then may analyse what has been said in an interview differently to their colleague. Reflexivity therefore is key in qualitative research.

Reflexivity denotes how a researcher accounts for their subjective and personal involvement in the carrying out of the research. This reflexivity ‘encompasses all aspects of personal identity, ranging from moment- by moment thoughts and feelings, through to social role and status’, (McLeod, 2015, pg.8). The notion of reflexivity can likewise to be used in relation to interviewees and their experiences. For instance an individual participating in an interview may repeatedly engage in self- reflection when deciding how to respond to questions. An important aspect of reflexivity is the researcher’s awareness of participant reflexivity. Despite the fact the researcher is present during the research process, there is potential to recognise specific moments during qualitative research when one may be particularly reflexive.

3.7 Ethical Issues

The researcher was conscious that although the interviews did not refer to sensitive personal issues the topic of career choice and the challenges of encouraging female participation in STEM subjects could still be sensitive for some participants. Oliver (2010) warns that there are possible areas for concern ethically when doing qualitative research. The sampling process is one such area- confidentiality of participants needs to be ensured. Comprehensive information should be provided to participants to ensure they understand the process and also the fact that they do not have to answer all questions. They should also understand how information gathered will be processed and stored.

Ethical approval was sought and granted from the University of Limerick. The participants were informed that they were not required to participate or fully complete interviews. They were advised that their involvement was completely voluntary and that they could withdraw from the research interview at any time. If for any reason the interviewee becomes upset the interview could be paused and the interviewee asked whether they wished to continue. If a participant at any stage decided to withdraw that data would have been discarded. If an

interviewee required support after the interview the researcher would have advised appropriately (for example the participant could have been advised to contact the relevant Employee Assistance Programme). The benefits and risks of the study were discussed with the interviewees. It was explained that the research could inform the researcher's work as a guidance counsellor and the work of STEM subjects and school managers. It was recognised by the researcher that those taking part will be giving up their time to take part in the research.

Data from the research will be stored securely for seven years in the principal investigators office. It will be available to the primary and secondary researchers only. Anonymity will be given to all participants. Individual names and school names are not included in the research. Data gathered is stored securely and encrypted on the researcher's computer. The researcher's computer is password protected and the password is known only to the researcher. Those participating in the research were informed regarding who has access to the data gathered and how long it will be stored for. Audio files were deleted once they have been transcribed. All other data will be stored in the University of Limerick. A summary of results will be provided to the participants who complete interviews. A full copy of the research will be available in the University of Limerick library.

3.8 Conclusion

The methodology chapter has explained the practical and philosophical approaches taken in this Master's research. This chapter has also described the research questions and the paradigms used. The research was completed through semi structured interviews to develop understanding in the area of research. Sampling, data collection and data analysis were examined. Potential ethical issues, validity and reliability are discussed. Chapter four will encompass the findings of the research using thematic analysis.

Chapter 4: Data Analysis and Findings

4.0 Introduction

The Data Analysis and Findings chapter will explain the data analysis used and demonstrate the findings from the data source- semi structured interviews. The data will be shown under four main themes- The Guidance Counsellor's Perception of STEM, Gender Stereotyping, The Influence of Parents as Perceived by Guidance Counsellors and The Influence of Gender. These themes were decided upon through thematic analysis after the transcribing of audio recorded interviews.

4.1 Analytical Strategy

As part of a qualitative approach six semi structured interviews with practicing guidance counsellors were completed. This approach was used to try and gain a better understanding of the perception of guidance counsellors regarding the challenges in encouraging female students to opt for STEM (Science, Technology, Engineering and Mathematics) subjects at post primary level.

The Methodology chapter has outlined that the interviews were recorded and later transcribed. An analysis of the audio recordings and transcripts was then completed. The themes were then grouped and Attride-Sterling's method of thematic analysis employed (Attride- Sterling, 2001).

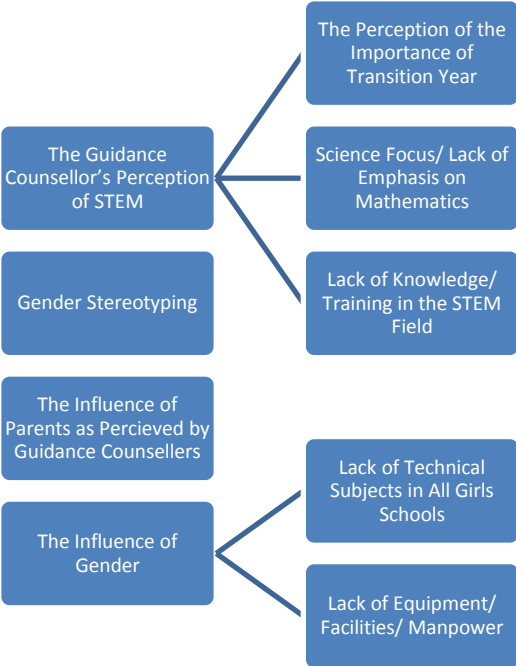
4.2 Participant Profiles

All of the participants were post primary teachers working in guidance counselling roles in the west of Ireland. Three of the participants worked in all girls schools while three worked in mixed schools. The schools varied from smaller settings of two hundred pupils to larger institutions of seven hundred pupils and were based in both in towns and the country. Some of the participants worked as guidance counsellors only while some also taught subjects part of the time. All of those interviewed were female.

The backgrounds of the interviewees varied also. All had a qualification in guidance counselling. However one participant initially studied psychology, one did a degree in business, another in art. All of those interviewed had more than five years' experience. The level of experience varied from five to thirty two years. All of those interviewed were the only guidance counsellor working in their school.

The analytical strategy used was thematic analysis, (Attride- Sterling, 2001).

There were four main themes identified when synthesising the primary data after collection. These are represented below in the diagram:



4.3 The Guidance Counsellor’s Perception of STEM

When interviewees were asked what they considered the most important aspects of their role in guiding female students to consider STEM subjects opinions varied. Some of those interviewed felt that there were opportunities associated with STEM subjects and that it was important to encourage participation- ‘opening up their minds to the careers and the opportunities that are available to them from STEM’, (Participant 2).

Some of those interviewed also thought that there should be an onus on schools to encourage female students to participate in STEM subjects. Some guidance counsellors believed that encouraging the female students to consider STEM subjects was an important aspect of their role. Several thought that it was important that all sexes should be encouraged to have the option to consider all subjects- not just STEM. This was a recurring theme in that many of those interviewed felt that there should be an onus on schools to encourage all subjects- not just STEM. They believed what was encouraged should depend on a student's interests and abilities.

'I like to just look at the student as an individual rather than saying STEM is a thing of the future and you have to go into that ', Participant 2.

Interviewee 3 explained that she would not 'deliberately steer them into it...if they had an interest in it I would point them in the right direction '. Participant 6 said that STEM is 'part of a broader spectrum...that's part of what we all do as guidance counsellors'. Participant 1 explained that she 'has to serve all students'.

'I really fundamentally believe that you must follow your interests...I never believe that sort of this thing that everyone should go the STEM route because that's where the jobs are', Participant 6.

There was a focus by some on the importance on not forcing any particular subject including STEM. Those guidance counsellors often considered a whole school approach as important and that there was a responsibility on the school and the other teachers- 'I think it's up to us, and it's up to all teachers and staff. And it's up to parents as well', Participant 5. Some of the guidance counsellors felt that the onus was on the teachers to encourage participation in their own subjects. Another thought that it was 'up to the particular college speakers', Participant 3.

Two guidance counsellors believed that they and their peers were starting to see the opportunities in STEM- they were 'starting to believe it because you can actually see it. You can read it in the papers now- that's where the jobs are a lot of the time', Participant 6. Two of those interviewed on the other hand felt that there was an overexposure to STEM- 'it's very much out there in the media. To be honest I'm nearly getting sick of it', Participant 4. The same participant thought that there was a risk that 'everything else has nearly been forgotten

about'. This was despite the fact that in her school there were no engineering or technology subjects. The interviewee mentioned that 'STEM is not at the top of everyone's list. It's certainly not at the top of mine'. The same guidance counsellor believed that the students were also 'getting a bit sick of it' but admitted perhaps she thought that because 'that is what I feel myself'.

Many of the guidance counsellors explained that the schools attempted to offer subjects based on the interests of the students. However in practice most schools were influenced by the qualifications of their staff- 'It would be a huge commitment if we were to introduce a lab and hire a teacher for example', Participant 5. There was an apparent paradox in the fact that in the all-girls schools the guidance counsellors thought there was less interest in the engineering and technology subjects. However those interviewed also believed the students were less likely to be interested in those subjects when they had not been exposed to them.

One guidance counsellor in the only mixed school with equal representation in subjects felt that there could be an improvement 'if we made the idea of the STEM subjects less exclusive', Participant 5. Some students, in her opinion, thought that they wouldn't be smart enough. She believed that there should be an effort to encourage inclusivity- 'Not just the ones who are getting the As and the Bs', that 'everybody can see that maybe it's an option'. There did seem to be that perception with some of those interviewed that STEM courses are only for the strongest students- 'if I know or I can see that they're really good at a kind of a science subject or they're great at maths', Participant 3. There was a perception that 'the teachers who teach those subjects ... would encourage and pick out...the best students'.

4.3.1 The Perception of the Importance of Transition Year

Many of those interviews cited transition year programmes as an important way to encourage students to consider STEM or other subjects through work experience and projects- 'they have a great opportunity in Transition Year, Participant 6. Some felt that students were more mature and more prepared to make decisions regarding subject choice after completing the course.

‘A lot of them are very young going into fifth year and so they’d be a little bit immature... the ones that are going from transition year into fifth year are more informed’, Participant 3.

‘Students that do transition year just know what they want to do. They are definitely more sure because there were exposed to different ways and different things... that year to experiment and make the better decision in my opinion or make a more informed decision’, Participant 1.

Students who complete transition year have more exposure to initiatives like work experience, speakers, days out and activity days. There was a feeling that if a student goes straight from junior certificate to fifth year that they can make mistakes. On the other hand in two schools where there was a focus on academics that there was a fear of doing transition year in case students lost the momentum of study. Some student would prefer to repeat fifth year rather than complete transition year- ‘it’s very strategic what they do’, Participant 3.

4.3.2 Science Focus/ Lack of Emphasis on Mathematics

When speaking about STEM all of those interviewed spoke the most about science and science subjects. When asked a question about STEM subjects some guidance counsellors spok either about science only initially or exclusively about science. It was mentioned that ‘we have a very strong culture of women in science’ but often that ‘we don’t have any engineering subjects’, Participant 1. Science was a popular subject in the schools of all of those interviewed who worked with either mixed or all female populations. Many schools had science as a mandatory subject at junior cert level. One guidance counsellor explained that- ‘We wouldn’t have 5% of students who don’t do it’ (science), Participant 4.

Most of the guidance counsellors strongly advised their students to consider taking science subjects at leaving certificate level. This was usually because biology and chemistry for instance were needed for a significant number of third level courses- mentioned most often were nursing, physiotherapy and dentistry.

‘The general rule of thumb is if they were totally unsure we kind of say well maybe a language is good and you need it for some courses. And a science subject is needed for an awful lot of courses’, Participant 2.

Any of the guidance counsellors that were asked questions about mathematics answered that mathematics was an obligatory subject so had no or little concern on that front.

‘They all do maths anyway’, Participant 4.

Despite the fact that most of those interviewees spoke about subject days, speakers and other initiatives to encourage the consideration of science subjects and occasionally engineering or technology none mentioned the encouragement of mathematics.

4.3.3 Lack of Knowledge/ Training in the STEM Field

None of those interviewed had taken opportunities to do training in STEM. Some of the participants had seen speakers offered through the IGC or conferences but had not attended same. Some guidance counsellors had previously got STEM speakers onsite but hadn’t in the previous school year as for example the vendors ‘have a few hurdles for me to cross’ in order to get the speaker to the school, Participant 4.

Most of those interviewed had not done a degree in a STEM subject. One guidance counsellor had done a degree in mathematics but said that she ‘wouldn’t consider myself to be a STEM’, Participant 2. She explained that she ‘thought it would be a good subject for teaching. I didn’t see the science or technology. I mean I certainly wouldn’t be of that background you know’. She explained that partly due to this she ‘certainly wouldn’t promote STEM’. Another guidance counsellor explained that STEM is ‘something that I don’t have exposure to’, Participant 3.

4.4 Gender Stereotyping

Throughout the interviewing process the researcher noted that opinions were expressed by those interviewed which could be perceived as stereotyping regarding gender. When asked why female students in one guidance counsellor's school were less interested in STEM and more interested in caring professions an interviewee said 'I honestly think it's their nature', Participant 4.

Participant 2 who worked in a mixed school perceived there to be no issue with regards to female students and STEM subjects. However she explained that while teachers would accept any boy that had an interest into their engineering class the girls are required to 'really sell themselves' to a teacher in order to be admitted to their class. So although the guidance counsellor felt that there were no barriers for women 'I guess the girls once they've proved themselves as kind of making progress, they do get in'. She also later stated that:

'Engineering even though it's encouraged if I looked at the numbers in an engineering class the percentage of males would greatly outweigh the percentage of females. Even though there is an encouragement to do it'.

One could question whether there was equal encouragement for both sexes if one group was required to 'sell themselves' while the other was not.

Some of those interviewed expressed opinions on their perceived differences between men and women.

'I think it goes with the species that women overthink things', Participant 2.

'Maybe it's part of how we're made up as women you know?', Participant 6.

Another guidance counsellor felt that although the female students experienced STEM subjects in transition year that:

'they're not opting for it...some of them I think don't want to do the practical side', Participant 2.

Others that did not work in schools that offered STEM subjects felt that even if the subjects were introduced that the students would not opt for them or opt for them longer term.

‘They would take them up more out of curiosity to junior level but maybe not take them up to leaving cert level’, Participant 3.

Participant 3 also explained that as the students were not showing the interest in STEM subjects now ‘it might never take hold’. However to another interviewee’s point if there is no technical subject offered and the students have no experience or awareness of that subject it could be difficult for them to express an interest.

One guidance counsellor in an all-girls school spoke about the fact that she believed women would all have children at some stage of their lives and that she explains this to her students and asked them to consider the fact that raising children may be difficult in a busy job where there are less holidays (as opposed to teaching where there would be more annual leave).

‘Women have to have babies at some stage in their lives. The man can’t have them. And like you know that’s a fact of life’, Participant 1.

In a classroom setting she explains to students that ‘there’s guidance of the career lifecycle and what’s really good now might not be in the future’. She picks what she sees as a ‘neutral job’ like accounting and explain that ‘you’re not going to have the holidays that you might get with such and such a job and you’re very much office based and while there’s huge opportunities and money to be made the hours you work and the effort you put into is directly related to the money’. Another guidance counsellor explained that there might be similar opinions expressed by parents in that- ‘parents would look down the road and say you’d get good holidays’, Participant 6.

It was also said by one person interviewed that roles that are dominated by women such as teaching and nursing are often unionized in her opinion-

‘The ones I associated with women were always public service and more protected’...male dominated careers...like medicine, engineering, law...all of those they aren’t regulated’, Participant 3.

One interviewee thought that ‘the lads would be more sciencey, more engineering...my perception is that ...lads would have veered naturally towards the engineering than the girls’, Participant 1.

4.5 The Influence of Parents as Perceived by Guidance Counsellors

All of those interviewed felt that parents were highly influential regarding their daughter’s subject choice- ‘they’d be the first advisors I think’, Participant 4. The same participant felt that parents primarily wanted their daughters to be happy and were not ‘going to use their own child as an example or to prove a point’. Another interviewee explained that parents in her opinion are ‘the biggest influence and ...they’d probably be more traditional in their approach’, Participant 2. One guidance counsellor said that parents might question whether their daughter doing engineering for example was ‘a good idea’, Participant 6. Parents in her experience have questioned in the past whether nursing or teaching would be better options for their daughters.

‘I could sway somebody some way but more often than not it’ll be the parents who’ll say yay or nay to what they feel. Parents have the last port of call really when it comes to it’.

One guidance counsellor felt that students follow their parent’s advice and opinions because they’re-

‘too afraid...they’ve done that all their lives- and it’s naturally in them to...and at that age of leaving certificate they’ve kind of gone back to listening to their parents again’, Participant 5.

However she warned that she felt that ‘hinders them from making their true decisions for themselves’. It was also said that a lot of parents ‘don’t believe that their child can actually make a good educated decision...they feel...why science or where would that go or engineering is really for men and they wouldn’t be able to cope in that environment’. Participant 6 said that the students’ parents can ‘think that the safer option is better’.

Participant 3 felt that to her ‘there wouldn’t be an interest in those subjects right off the bat’. She explained that normally female students who chose technical subjects had already been exposed to those subjects by their parents who were for example engineers- ‘they have been immersed in it right throughout their lives’. Role models in that sense seemed to be important in some interviewee’s opinions. It was felt that it was ‘more valuable when they talk to people they know’, Participant 6. Likewise ‘if you have a good teacher in junior cert in science like in our school I think that’s very positive’, Participant 1.

4.6 The Influence of Gender

Some of those interviewed felt that their female students viewed STEM subjects and careers as male dominated and that female students would prefer to study and or work with their peers.

‘They want to be with the girls, with their peers’, Participant 6.

‘They look up and they see the pictures of what’s going on in the third level and they see a class full of boys in the engineering section. The girls don’t see themselves fitting in there’, Participant 4.

‘I think it’s society as well. You know the way...like it’s a boy’s job’, Participant 3.

Participant 3 also mentioned that more technical subjects would be ‘seen as boy’s subjects...the civil engineering and the mechanical engineering...very much a masculine sort of thing to do’.

Another interviewee explained ‘people take for granted osmosis- you know you just suck up this stuff that’s around you...you know no matter what was you turn a child’s head you can’t deny the fact that if you walk into a hospital the majority of the nurses are women and things like that’, Participant 1. One interviewee felt that for example her female students were influenced by their experience in primary school because it was often female dominated, Participant 6.

Most interviewees felt that the spread of girls and boys in Science was similar- particularly in biology and chemistry in some schools. Physics on the other hand, technology and engineering were dominated by boys. One interviewee mentioned that ‘girls are always in the minority’, Participant 4. One interviewee explained that on occasion girls went to the University of Limerick or NUI Galway to study engineering but over the last number of years she ‘could count them on one hand’, Participant 3.

Some of the guidance counsellors believed that there was a perception amongst the female students that STEM subjects were more difficult than others.

‘I suppose some of them perceive them as difficult’, Participant 4.

Three of those interviewed said there was a huge focus on the ‘points race’. Students chose subjects at times based on what they thought would offer them the most points. They were ‘strategic the way their mindset and in which subjects they picked’... ‘They’re all thinking about points. It’s pressurized. It’s a pressurized decision at the same time’, Participant 1. It was explained that what’s important to students is getting points and that may not lend itself to choosing subjects that a student perceives as being difficult.

Three of those interviewed spoke about the fact that their female students often had the aim of working in ‘helping careers’ or ‘caring professions’.

‘A lot of girls don’t choose science at degree level because they didn’t perceive them as being in the helping careers’, Participant 4.

The girls that the guidance counsellors supported often wanted to work as physiotherapists, occupational therapists and speech and language therapists because they say ‘I just want to help people’, Participant 4. They do not tend to see professions in engineering or science as helping professions.

One interviewee felt that if STEM was less exclusive females might feel more open to considering those subjects. She felt that for years there was an attitude towards women particularly in Ireland that those (STEM) subjects or careers were ‘not for you...you just sit there and be pretty’, Participant 5.

‘It creates this exclusive club and a lot of the time students haven’t the confidence to think that they’d be allowed be considered for that. So it’s easier being something else. A nurse or a teacher’.

4.6.1 Lack of Technical Subjects in All Girls Schools

None of the all- girls schools from which guidance counsellors were interviewed offered all STEM subjects- particularly technology and engineering.

‘We would have very female orientated subjects...we don’t offer woodwork, metalwork, construction, technology...we don’t even offer mechanical drawing at junior cert’, Participant 3.

There was a feeling that ‘they’re generally happy with what’s on offer’, ‘no engineering subjects now. And there was never any talk of it’, Participant 1. However it could be argued that the students never had the options to consider any other subjects other than what was offered. One interviewee pointed out that in her opinion if the students are not exposed to the subject at any stage as a consequence it is not in their awareness.

The guidance counsellor who had seen disparities in previous all- girls’ schools in which she had worked explained that in her view if STEM subjects aren’t offered then ‘it’s not in the culture at all’, Participant 5. She felt for instance when Home Economics was usually offered in an all-girls school but STEM subjects were not- ‘It does start you off seeing that you should be cooking and you should be doing this and doing that and putting them in a box which is what we’ve done for years’. This guidance counsellor felt that ‘we pretend were not doing that but in reality it is being done’. She cited the example of school uniforms where girls were not permitted to wear trousers in some cases like the male students. She felt that ‘There’s something that we’re still trying to hold on to this gender difference. As women we should be trying to get rid of that so that we become equals... we deserve to be equal, not different or not better’.

Participant 5 explained that they were ‘actually gearing the subjects towards the gender of the student’. Another guidance counsellor contended that in an all-girls school not only are the

subjects not offered but they don't have the opportunity to even listen to male peers discussing those subjects which a female student might have in a mixed school.

'If you were in a mixed school and you have a good friend of yours on the bus and he's doing ...construction or technology, you're going to...it's going to come up in conversation', Participant 1.

'The fact that we don't have some of those subjects (*is a barrier*)...and we're at a loss as well because we don't have boys in the school ...because if there was exposure to it through the lads saying 'Jesus this is great'', Participant 3.

Again there was a potential paradox that most thought that there was enough being done to encourage girls to consider STEM subjects- 'In my school there's probably enough being done'- despite the fact that technology and engineering were not offered in the school in which she worked, Participant 6. One guidance counsellor felt that her school was unique because 'we make them do science up to junior cert level', Participant 2. However the majority of those interviewed mentioned that science was obligatory in their school up to junior cert level. Some guidance counsellors felt that they didn't have to encourage science because the school 'exposes them to science from first year to third year', Participant 2. One of those interviewed said that girls were very open to STEM and that she did not see it as an issue in her school. This is despite the fact that she later mentioned that she and the students in her opinion were sick of STEM and that she could count on one hand the girls that had gone on to do engineering at third level from their very academic school, Participant 3.

4.6.2 Lack of Equipment/ Facilities/ Manpower

One guidance counsellor out of the six interviewed explained that there was almost the same uptake at leaving cert level for girls as boys regarding STEM subjects. The same school had a principal and vice principal that had engineering backgrounds (and a perhaps greater interest therefore in STEM subjects).

'We have top class equipment. I mean the engineering facilities in the school are second to none. So we would be known as a big engineering school', Participant 2.

All of the schools that did not offer technical subjects explained that even if they did decide to introduce that it would be difficult to support when it would come at great monetary cost.

‘I don’t think we’d be able to cater for them. As in we wouldn’t have the facilities or the manpower...that would be an absolutely massive move...I can’t even imagine it’, Participant 3.

Many of the guidance counsellors explained that the schools attempted to offer subjects based on the interests of the students. However in practice most schools were influenced by the qualifications of their staff.

‘It would be a huge commitment if we were to introduce a lab and hire a teacher for example’, Participant 4.

4.7 Conclusion

The Data Analysis and Findings chapter highlighted key themes that emerged from the data that was gathered for this research. The transcripts of the semi structured interviews were used as the primary data source. Four main themes were identified, analysed and presented as well as five sub themes. The next chapter will distil key issues from the Data Analysis and Findings and explore these in the light of the literature reviewed.

Chapter 5: Discussion

5.0 Introduction

The Discussion chapter will show a critical analysis of the findings of the research in the context of the literature review (chapter two). The interpretation will be shown under the headings of the four main themes that arose during data analysis.

5.1 Research Aims and Research Questions

This dissertation outlines the perceptions of six guidance counsellors and the roles that they play in guiding female students towards considering STEM subjects at a post primary level. The aim of this work was to develop understanding regarding their perception. It is hoped that this work will be of assistance to guidance counsellors and teachers working in post primary education.

The chief research question was:

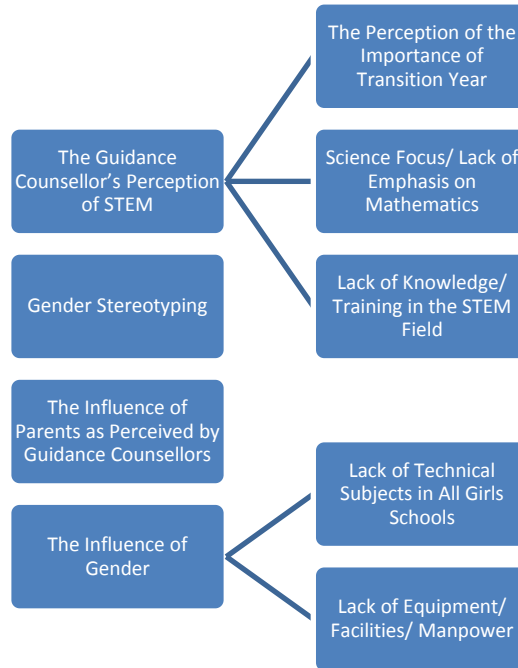
‘To examine the perception of guidance counsellors regarding the challenges in encouraging female students to opt for STEM (Science, Technology, Engineering and Mathematics) subjects at post primary level’

To address the chief research question, three secondary questions were identified:

1. To examine guidance counsellors’ perception of STEM subjects as a subject choice
2. To investigate the influence of gender on STEM subject choice from guidance counsellors standpoint
3. To examine parental influence on female students in choosing STEM subjects as perceived by guidance counsellors

A positivist qualitative paradigm was used in the study. As part of this paradigm semi structured interviews were adopted (Blaxter, 2010).

Four main themes were identified from thematic data analysis:



5.2 The Guidance Counsellor's Perception of STEM

The role of a Guidance Counsellor is to 'engage in personal, educational, and vocational counselling with clients throughout the lifespan, in the particular circumstances of their life', (IGC, 2010, pg.3). A guidance counsellor should be capable of enabling choices through the lifespan including personal, life and career. There is a focus on employability and work readiness currently in guidance settings as the sector prepares to be more responsive to the developing needs of the labour market, (Department of Education and Skills, 2011). However there is 'more to employability than gaining employment', (Pool & Sewell, 2007,pg.228). 'Employability is about being capable of getting and keeping fulfilling work', Hillage and Pollard (1998, p. 2).

There were some positive examples in the primary data of a focus on employability and providing a rounded approach to guidance counselling. Many of those interviewed saw the importance of encouraging STEM or at least presenting STEM subjects as an option to female

students- ‘opening up their minds to the careers and the opportunities that are available to them from STEM’. Some of the participants likewise felt that there should be an onus on schools to encourage female participation in STEM subjects.

There was a recurring theme in the importance of a whole school approach. This approach was first emphasised in policy in the Green Paper, (Department of Education and Science 1992). As part of the whole school approach many of those interviewed explained that there was a responsibility not just with the guidance counsellor but with the school, teachers and parents. ‘... I think it’s up to us, and it’s up to all teachers and staff. And it’s up to parents as well’. Some also emphasised the responsibility of the colleges and their representatives. It was important to some to encourage both girls and boys to consider all subjects. STEM was seen often as one part of a broader spectrum of subjects that students should consider. Another participant would not ‘deliberately steer them into it...if they had an interest in it I would point them in the right direction’. Most of those interviewed felt strongly that their role was to serve all of their students. A student’s abilities and interests were seen as important.

‘I like to just look at the student as an individual rather than saying STEM is a thing of the future and you have to go into that’.

The opinion on STEM itself as a career option varied amongst those interviewed. There was a feeling that guidance counsellors and their peers were starting now to see the opportunities in STEM.

They were ‘starting to believe it because you can actually see it. You can read it in the papers now- that’s where the jobs are a lot of the time’.

Others however felt that there was an overexposure to STEM. They saw STEM as being pushed by the media at times and Participant 4 was ‘nearly getting sick of it’. She felt that ‘everything else has nearly been forgotten about’. STEM was not at the top of these participants’ agenda. This was seen in the literature where some guidance counsellors surveyed had negative opinions around STEM and STEM subjects, (Institute of Engineering and Technology 2008). STEM subjects ‘are widely perceived by ... career guidance counsellors as being difficult, and not relevant to many young people’s lives’, (The STEM Education Review Group, 2016, pg.43).

Most of those interviewed explained that their schools tried to offer subjects based on the interests of the students. In practice however most schools were influenced by the qualifications of their staff and the facilities available.

‘It would be a huge commitment if we were to introduce a lab and hire a teacher for example’.

It could be argued that there is a paradox where the guidance counsellors in all-girls schools felt that there was little interest in more technical subjects. However to one guidance counsellor’s point it was difficult for students to have an interest when they had never had an exposure to those subjects.

5.2.1 The Perception of the Importance of Transition Year

The transition year programme was seen by many as an important way to encourage students to consider STEM or other subjects through work experience and projects. The opportunities the year offered were held in high regard. Students it was felt became more mature and better prepared to make decisions regarding subject choice after completing the course.

‘Students that do transition year just know what they want to do. They are definitely more sure because they were exposed to different ways and different things.... that year to experiment and make the better decision in my opinion or make a more informed decision’.

Those who partake in transition year have exposure to a range of initiatives such as work experience, speakers, days out and activity days. It was thought by interviewees that students who complete transition year are less likely to make mistakes. Literature recommends access to work placements as well as guidance and access to role models, (IBEC, 2017), (Sharkawy, 2015). Guest speakers and internships have also been highlighted as important influencers, (Learning & Skills Bulletin, 2017).

5.2.2 Science Focus/ Lack of Emphasis on Mathematics

A recurring theme in the primary data was the reference to science mostly or only when speaking about STEM. When asked a question about STEM as a whole some interviewees spoke either about science only initially or exclusively about science. A strong culture of science in a school was often referred to when asked about STEM. When questioned about engineering however schools often did not offer that subject.

Science was a popular subject in the schools of all of those interviewed whether the school was all-girls or mixed. Participant 4 explained- ‘We wouldn’t have 5% of students who don’t do it’ (Science)’. Often the subject was mandatory up to junior certificate level. There was an emphasis in the primary data on biology in particular. This is interesting when one reviews the 2018 leaving certificate results. Biology is one of the two eleven STEM subjects in which the gender bias favours girls. It could be said that there is less of a need to focus on biology when considering female students as they are leading in that area, (State Examinations Commission, 2018).

Many of those interviewed advised their students to consider taking science subjects at leaving certificate level. This was because science subject is needed for a significant number of third level courses- mentioned most often were nursing, physiotherapy and dentistry. As discussed later these are also courses that female students want to consider because they are ‘helping careers’ or caring professions’.

Mathematics was a subject that no participants were concerned about as mathematics was an obligatory subject. In one regard the participants may be correct as mathematics at leaving certificate overall shows a bias towards girls, (State Examinations Commission, 2018). However if one reviews the higher level data only there is a bias towards boys, (State Examinations Commission 2018). It could be argued that because mathematics is obligatory guidance professionals could be missing the fact that less female students are choosing the subject at a higher level.

5.2.3 Lack of Knowledge/ Training in the STEM field

Some guidance counsellors in the post primary sector in Ireland can be seen to be ‘lacking in bridging the knowledge gap for career choices and new perspectives for boys and girls’, (IBEC, 2017, pg.2). There is also a disconnect between subject choice in leaving certificate and the needs of the STEM industry. This could be seen in this study as none of those interviewed had had the opportunity to do any training in STEM. Some had seen speakers offered through the IGC or conferences but none had attended same. Some guidance counsellors had previously gotten STEM speakers onsite but hadn’t in the previous school year as for example the vendors have ‘a few hurdles for me to cross’ in order to get the speaker to the school.

The majority of those interviewed had not done a degree in a STEM discipline. One participant had done a degree in mathematics but said that she ‘wouldn’t consider myself to be a STEM’. She had chosen the subject because she thought it would be a good subject for teaching and did not see herself as being of a STEM background. Another guidance counsellor explained that STEM is ‘something that I don’t have exposure to’, Participant 3.

5.3 Gender Stereotyping

Gender stereotypes are generalized ‘socially shared beliefs that certain qualities can be assigned to individuals, based on their membership in the female or male half of the human race’, (Lips, 1988, pg.2). Gender stereotyping is a persistent issue in Ireland, (Science Foundation Ireland, 2012). Gender stereotyping adds to segregation and can limit opportunities for women in education and employment. Significant stereotyping is thought to be in existence in the post primary school system in Ireland including the stereotype that STEM subjects and careers are more suitable for men, (Accenture, 2014).

Five of the six guidance counsellors interviewed expressed opinions which could be said to be stereotyping of gender in relation to subject/career choices. For example when one participant was asked why female students participated in STEM subjects less than their male counterparts she said ‘I honestly think it’s their nature’, Participant 4. Several participants

expressed the opinion that male students would migrate more naturally to engineering, science or technology subjects than the female students would.

IBEC (2017, pg.2) argued that there is a need for all influencers of female students including teachers and guidance counsellors to ‘challenge occupational stereotypes by encouraging more women into male dominated industries and investing in careers advice that provides real information and options to students’, (IBEC, 2017, pg.2). It is argued that awareness of gender stereotyping should be built into initial teacher education programmes. Some of the literature argues that STEM subjects should be open to all students- male and female- at post primary level in order to raise awareness to significant education and career options. Effective career guidance is needed as well as access to work placements and role models.

One interviewee from a mixed school felt that there was no issue regarding female participation in STEM subjects. However she then explained that while any boy would be allowed to participate in engineering at leaving certificate level, girls were required to ‘really sell themselves’ to a teacher in order to participate. The guidance counsellor felt that there were no barriers for female students and that ‘I guess the girls once they’ve proved themselves as kind of making progress... they do get in’. The same school also had classes in which boys outweighed girls ‘even though it’s encouraged’, Participant 2.

One study found that the older children they questioned had significantly less stereotyped views concerning which genders should perform which roles. Boys in the study ‘sex-typed appropriateness of occupations to a significantly greater degree than girls’, (Miller & Budd, 2006, pg.17). The study found no ‘consistent or stable pattern of preference’ for genders regarding subject choice which the authors argued suggested show that ‘gender stereotyping of school subjects is weakening’, (Miller & Budd, 2006, pg.17). Gender stereotyping in schools may be weakening especially amongst students but significant examples were present amongst those interviewed. Some interviewees shared opinions on the supposed differences between genders- that women overthink things or that female students might not consider STEM subjects because it wasn’t in their ‘makeup’. Another opinion expressed was that female students might not choose STEM subjects because they would not enjoy the practical aspect.

Gender stereotyping can present a threat when female students may have anxiety when there is the potential of confirming stereotyping regarding their social group, (Spencer et al, 1999). Stereotype threat can be ‘a particular type of contextual barrier to women’s STEM career development’, (Deemer et al, 2013). Resulting low self-efficacy can contribute to underrepresentation of women in STEM. Some of the opinions expressed by those in this study could lead to low self-efficacy on behalf of their female students. For instance the example given of female and male students being treated differently by teachers when they expressed an interest in studying engineering at leaving cert.

One participant explained that in her opinion all women would have children at some point in their lives. She therefore explains this to her students each year and directs them to consider that being a mother could be difficult in a busy job where there is less annual leave. Teachers on the other hand she explained would have shorter hours and more holidays.

‘Women have to have babies at some stage in their lives. The man can’t have them. And like you know that’s a fact of life’.

The guidance counsellor explains to her students that ‘there’s guidance of the career lifecycle and what’s really good now might not be in the future’. She uses Accountancy as an example to show that if a student chooses that career she will have fewer holidays and would be more office based, Participant 1.

Some guidance counsellors who work in all girls schools that did not offer technical subjects thought that if technical subjects were introduced that the students would not take them at leaving cert level. One interviewee felt that as the students were not showing interest in technical subjects presently ‘it might never take hold’. However to another participant’s point if there is no technical subject offered and the students have no experience or awareness of that subject it could be difficult for them to express an interest. In light of the above attitudes expressed the initial education of guidance counsellors and their CPD should address gender stereotyping and it’s effects on subject and career choice.

5.4 The Influence of Parents as Perceived by Guidance Counsellors

As mentioned IBEC (2017, pg.2) explained that the roots of segregation in subjects choice can be found in our culture and our education system which socialises young people into an ‘expectation of certain roles as women’s work or men’s work, beliefs which can be reinforced consciously or unconsciously by teachers, parents, employers and society’. Parents in particular can have a significant influence in a child’s subject and career choices. Mothers are especially influential regarding their daughters, (McQuaid & Bond, 2004).

A theme in all of the interviews was that parents were highly influential regarding their daughter’s subject choice. They were seen as the first advisors of their daughters and the biggest influence.

‘parents have the last port of call really when it comes to it’, Participant 1.

One issue with parents having such influence is that the accuracy of the advice may be lacking in comparison to more formal advice networks such as guidance counsellors, (McQuaid & Bond, 2004, pg.10). Parents and guardians can lack the required information regarding options, (Learning & Skills Bulletin, 2017). One opinion expressed in the primary data was that students may come to rely on the opinions of their parents at leaving certificate level because they’re ‘afraid’. Although in their earlier teenaged years students may have moved away from listening to their parents, by the leaving certificate year they return to being influenced as the year is pressurised and they’ve previously naturally gone to their parents for advice. Participant 5 was concerned that this ‘hinders them from making their true decisions for themselves’.

Another issue seen in the primary data was that parents may not trust their child to make the correct decision. Parents of girls may feel (in the opinion of Participant 5) that STEM careers are more suited to men and that their daughter might struggle to cope in that environment. Participant 6 felt that parents can think that ‘the safer option is better’. Therefore female students considering STEM may be waylaid at leaving certificate by parents who lack education around options and are concerned for the welfare of their daughters.

A study by Accenture (2013, pg.6) found that parents were a major barrier to female students studying STEM because they can promote stereotypical 'girl career paths' like nursing and teaching and see earning maximum points as the most issue at leaving cert. This was seen throughout the interviews where guidance counsellors felt that parents could be traditional or have an 'old point of view', Participant 5. Nursing or primary school teaching were often the preferred options of parents as perceived by the guidance counsellors interviewed.

The circumstances of parents can also have an effect. For example if a mother has a higher level of education they may have more of an uncensored democratic view of gender roles for their child, Kulik, 2002). Some of those interviewed felt that female students were less likely to be interested in STEM subjects unless they had been exposed to engineering in particular by their parents - 'they have been immersed in it right throughout their lives', Participant 3. Role models therefore seemed to be significant in the opinion of some those interviewed. 'Good' teachers and other females working in industry that the students might know were seen as having significant impact.

Parents' 'education, religiosity and politics increase home environments that perpetuate their values in their children even beyond their own measured attitudes and socialisation practices', (Antill et al, 2003, pg.150). Stereotypes seemed prevalent in the opinion of those interviewed with some parents who held traditional views at times. Gender stereotypes are an ongoing issue faced by women. This segregation can start when a child chooses their subjects at post primary level where they can unwittingly limit their future field of study and career options, (Science Foundation Ireland, 2012). A person's perception regarding their career is influenced by socialisation, (Eccles, 1994). Parents through socialisation can influence this perception through information and experiences that they provide.

Career decision making can be seen as being influenced by four categories- environmental conditions and events, genetic endowment and special abilities, learning experiences and task approach skills, (Krumboltz et al., 1976). Genetic influences can be seen as relevant when considering the influence of parents on their student daughters. Parents can influence depending on what support, guidance and confidence building that they provide to their daughters. If the support and guidance is given in such a way to build confidence children can feel empowered in their choice of career, (Sharkaway, 2015). Positive examples mentioned in

this study were parents who were already in technical roles that encouraged their daughters to consider STEM subjects. Inheritances in this sense are relevant when considering the influence of parents on a student's subject or career choice. Inkson et al (2015) explained there we are born with inheritances which influence our career such as sex, genetic makeup and race. Others such as 'values, motivation, and education, are developed in childhood largely as a result of family influences and become part of what we bring a career', (Inkson, 2007, pg.28).

5.5 Influence of Gender, culture and society

The origins of segregation in subject choice can be found in our education system and in our culture which socialises young people into an 'expectation of certain roles as women's work or men's work, beliefs which can be reinforced consciously or unconsciously by teachers, parents, employers and society', (IBEC, 2017, pg.2). The path for female students has been described as difficult who are at a persistent disadvantage which is 'systemically embedded in Science, Technology, Engineering, and Math (STEM) education in postsecondary institutions', (Parson, 2017, pg.7)

As previously discussed in this chapter an ongoing issue facing female students is gender stereotyping which can influence opportunities in education, employment choices and admittance to higher level jobs, (Science Foundation Ireland, 2012). Significant barriers have been found in the post primary school systems for female students including negative stereotyping that STEM subjects and jobs are more suited to men, (Accenture, 2014). A student's opinion regarding their vocation is influenced through socialisation, (Eccles, 1994). As discussed in this chapter, guidance counsellors, teachers and parents influence a student's perception of choice through the experience and information they provide.

In most mixed schools in which the interviewees worked the spread of girls and boys in science was similar- in biology and chemistry in particular. Physics by comparison, technology and engineering were dominated by boys- 'girls are always in the minority', Participant 4. Another guidance counsellor who felt that there was no issue with STEM

subject uptake in her school could count on one hand the number of girls who had gone on to study engineering at third level.

‘I think it’s society as well. You know the way...like it’s a boy’s job’, Participant 3.

The primary reason a student chose a subject in one study was ‘enjoyment, and to a lesser extent, interest and being good at a subject’, (McQuaid and Bond, 2004, pg.6). Some students picked subjects because they thought the subjects would be helpful regarding the career they hoped to pursue in future. This was found to be partially true in the study. Some of those interviewed thought that there was a perception that STEM subjects were more difficult than other subjects. Three of the guidance counsellors felt that there was a heavy focus on the ‘points race’. Students often chose subjects based on what they hoped would offer them the most points. It could be argued that seeking to do this might not lend itself to choosing subjects that a student perceives as being difficult.

Male and female students can rate the aspects of a job that are important differently. Self-efficacy has an influence regarding students and their subject choice. Self-efficacy can be described as a person’s ‘judgement of their ability to carry our actions in order to reach their goals, (Barnes et al., 2004, pg.16). Students with low self-efficacy can experience of anxiety and lack necessary support and modelling from others, (Kidd, 2006). Students with high self-efficacy are confident in their abilities to organise themselves and carry our activities necessary to achieve their goals, (Betz, 2000). The opinions a person has about their own capabilities can affect their behaviours. The experiences a student has can limit their participation in certain activities. Girls are often encouraged into more caring activities whereas boys may be more allowed to partake in more practical or messy activities. Half of those interviewed explained that female students often wanted to work in ‘helping careers’ or ‘caring professions’.

‘A lot of girls don’t choose science at degree level because they didn’t perceive them as being in the helping careers’, Participant 4.

Differential self-efficacy is grounded in gender, ethnicity and social class. Women and men have higher self-efficacy in occupations where their gender dominates. Female (and male) students then drift towards studies and jobs that are dominated by their own gender,

(Anderson, 1998). McQuaid and Bond (2004, pg.7) found that the students they surveyed 'remained persistently gender stereotyped' around certain jobs. Females were found to be less stereotyping of jobs than their male counterparts. Students' job preferences for themselves have also been seen to be traditional in some cases, (McQuaid & Bond, 2004). While girls thought that they 'were suited to work in some previously male-dominated professions', it was uncommon for girls to think that they were suited to the occupation of engineer (10% of girls versus 63% of boys), (McQuaid & Bond, 2004, pg.8). There was also an inclination for both sexes against working in jobs that were traditionally associated with the opposite sex. Several of those interviewed were of the opinion that girls might be drawn to jobs where they saw women dominate- nursing or teaching for example. Some participants thought that female students viewed STEM subjects and careers as male dominated and that female students would prefer to study and or work with their peers.

'They look up and they see the pictures of what's going on in the third level and they see a class full of boys in the engineering section. The girls don't see themselves fitting in there', Participant 4.

Some of those interviewed explained that female students can see STEM subjects as subjects for boys or as 'very much a masculine sort of thing to do', Participant 3. There was a recurring theme also that what a child sees around her is influential. One interviewee labelled the process osmosis and several said that a female student might be influenced by seeing in a hospital that the majority of nurses are women or that in a school the majority of teachers or women.

In one study 68% of students knew someone who had the student's preferred future job, (McQuaid & Bond, 2004). Girls who thought that women were suited to traditionally male jobs were more likely to think that they themselves could be suited to traditional male jobs. This was seen as mentioned where guidance counsellors interviewed felt that students were more likely to consider technical subjects if their parents worked in that area. Role models and 'good' teachers' were also seen as important.

5.5.1 Lack of Technical Subjects in All Girls Schools & Lack of Equipment/ Facilities/ Manpower

None of the all-girls schools from which guidance counsellors were interviewed offered technical subjects- ‘We would have very female orientated subjects’, Participant 3. Cronin (2013) explained that provision of a subject is a large influence of subject choice, particularly in all-girls school in Ireland which often do not offer technical STEM subjects.

All of the three guidance counsellors interviewed from these schools believed that this was not an issue, that the students are ‘generally happy with what’s on offer’ and that there wasn’t a demand for technical subjects. It could be questioned however whether students who are not exposed to subjects have the opportunity to consider or request them. One guidance counsellor working in a mixed school who had previous experience in an all-girls school thought that if STEM subjects aren’t offered then ‘it’s not in the culture at all’, Participant 5. She felt that ‘they were actually gearing the subjects towards the gender of the student’.

In this case Gottfredson’s theory of Circumscription and Compromise is relevant when considering how female students in all-girls schools choose subjects, (Gottfredson, 2005). After circumscription (when options outside of a social space have been omitted), compromise occurs where a student may be ‘inclined to sacrifice roles they see as more compatible with their self-concept in favour of those that are perceived to be more easily accessible’, (Gottfredson, 2005, pg.5).

The opinion was also expressed in interviews that in an all-girls school the students don’t have the opportunity to listen to male peers discussing those technical subjects which a female student might have in a mixed school. All of the schools that did not offer technical subjects explained that even if they did decide to introduce them, it would be difficult to support when it would come at great monetary cost.

‘I don’t think we’d be able to cater for them. As in we wouldn’t have the facilities or the manpower...that would be an absolutely massive move...I can’t even imagine it’, Participant 3.

5.6 Conclusion

The Discussion chapter has offered a critical analysis of the interpreted primary data collected in the research in the context of the literature review. This was shown through four main themes:

- The Guidance Counsellor's Perception of STEM
- Gender Stereotyping
- The Influence of Parents as Perceived by Guidance Counsellors
- The Influence of Gender

The following chapter will offer a conclusion to the dissertation including an assessment of the research and recommendations for practice, policy and future research.

Chapter 6: Conclusion

6.0 Introduction

In the conclusion chapter a synopsis of the data is presented within the context of the aims and objectives of the research. The strengths and limitations of the study will be discussed.

Recommendations will be given for practice, policy and future research. Lastly there will be a reflection on the research process.

6.1 Findings Overview

The main aim of the study was to develop understanding of guidance counsellors perceptions of the issues regarding female students decision whether or not to partake in STEM subjects at post primary level.

The specific objectives were:

1. To examine guidance counsellors' perception of STEM subjects as a subject choice
2. To investigate the influence of gender on STEM subject choice from guidance counsellors standpoint
3. To examine parental influence on female students in choosing STEM subjects as perceived by guidance counsellors

The aim and objectives of the study were examined comprehensively. A thorough literature review was completed which included career theory in the context of women and STEM. The role of the guidance counsellor was explored and Irish education policy considered in the realm of STEM. The findings of the literature review in relation to the role of the guidance counsellor, gender stereotyping and career theory shaped the objectives of the research. These secondary findings from the literature also influenced the methodology and the methods by which the primary data was captured and analysed. The following section will highlight the key findings.

6.1.1 Summary of Findings

Several themes became clear after interviews had been completed and thematic analysis finalised.

It was clear that parents were a major influence on subject choice for students at post primary level as perceived by guidance counsellors. This was in line with literature which outlined that gender roles can be reinforced by parents, (IBEC, 2017). Parents were identified by many of the participants as the primary advisors of their daughters. This was seen as a potential issue both in literature and in the primary data as parents might be lacking in information or might hinder students from making the appropriate decision, (McQuaid & Bond, 2004). Parents- in the opinion of some participants- could be traditional in their opinions and approaches and also stereotyping of gender at times. The concept of socialisation and in that context the influence parents can have was an important consideration, (Eccles, 1994). Career decision making likewise can be influenced by environmental conditions such as genetic influences, (Krumboltz et al., 1976).

Gender stereotyping was the second major theme identified through thematic analysis. Secondary data explained that such stereotyping can encourage segregation and limit opportunities for females in employment and education, (Accenture, 2014), (Science Foundation Ireland, 2012). Five of the six individuals interviewed expressed opinions that could be categorised as stereotyping of gender. IBEC (2017, pg.2) explained that there is a requirement for influencers of female students such as teachers and guidance counsellors to ‘challenge occupational stereotypes by encouraging more women into male dominated industries and investing in careers advice that provides real information and options to students’, (IBEC, 2017, pg.2).

The Influence of Gender was prevalent too as a theme in the primary research. STEM subjects for some were seen as fields for men and that girls struggled to see themselves as fitting in. This was a persistent theme in the literature also, (Parson, 2017), (IBEC, 2017). There was a link between the subjects girls chose and a perceived desire to pursue a ‘helping career’. All of those interviewed from all -girls schools explained that their schools lacked technical STEM subjects. There was a perception that girls hadn’t shown an interest in those subjects. However

to another's point girls had not had the opportunity to consider those subjects. The cost of introducing some STEM subjects when they were not already in place was also an issue- from a facilities, equipment and manpower point of view.

The last major theme was found to be the guidance counsellor's perception of STEM. This perception varied by individuals interviewed. Some saw opening a student's mind to the option of STEM as important and spoke about the opportunities associated with STEM. Others were 'getting sick' of the prospect of encouraging STEM and felt strongly that students should follow their interests. Subthemes that emerged included the perception of the importance of transition year and a focus on science paired with a lack of emphasis on mathematics.

6.2 Strengths and Limitations of the Research Study

The following sections will present the strengths and limitations of the study.

6.2.1 Strengths

Previously research in guidance has focused on the positivist approach, (Reid & Bimrose, 2006). Recently there has been greater support for use of interpretivism, (Blaxter, 2010). This research study took an interpretivist approach. Interpretivism is subjective and focused on the generation of theory, (Flick, 2011). This research is qualitative in its orientation. This orientation is 'used to identify approaches to social science that share particular ontological and epistemological assumptions', (Lewis-Beck et al, 2004, pg.509). The belief is that because there is major difference between social and natural sciences, the approaches of the natural sciences are not appropriate to use in the social sciences. When studying social phenomena one needs to comprehend the social environments that individuals inhabit 'which they have already interpreted by the meanings they produce and reproduce as a necessary part of their everyday activities together', (Lewis-Beck et al, 2004, pg.509). Interpretivism attempts to be objective around the subjective- to produce 'verifiable knowledge of the meanings that constitute the social world', (Lewis-Beck et al, 2004, pg.510).

As part of this approach semi structured interviews were used to collect primary data. Candidates had at least two years experience working with female students in a post primary setting. They therefore had exposure to occasions where their students considered STEM subjects. The benefits of semi structured interviews were that interviewees had the opportunity to be more subjective. Interviews were face to face which created a safe climate for the exploration of issues. As the research was qualitative it has more depth, (Cohen et al, 2011). Greater adaptability could be gained through probing questions which resulted in deeper insights into motives and feelings of those being interviewed, (Bell, 2005).

6.2.2 Limitations

The interpretivist approach the study undertook also has its' limitations. Interpretivism is qualitative and subjective. There is a focus on the generation of theory, (Flick, 2011). Some argue however that one does not continually monitor one's conduct and that one is not always conscious of why one takes a certain action or their intentions, (Giddens, 1984). Others contend that research in social science should be able to offer a different account of an individual's actions rather than only what the individual themselves believe, (Rex, 1974). The approach has been described as a 'linguistic fallacy, which is based on a failure to recognize that there is more to reality than is expressed in the language of social actors', (Lewis-Bleck et al, 2004, pg.510). There is a further argument that interpretivism does not take into account the role of institutional arrangements such as divisions of interest and relationships of power.

The extent of the research could be considered a limitation as six individuals only were interviewed. As an interpretivist approach was taken semi structured interviews were decided upon as the method of gathering primary data. Again there are limitations associated with this approach. Interviews necessitate access to a smaller or more limited group of participants than for example a survey. There is more potential for bias and misinterpretation by the researcher.

6.3 Recommendations: Practice; Policy; Research

Following are a number of recommendations based on the findings of the research in the context of practice, policy and future research.

With regards to policy it is recommended that:

1. The Irish Government update the current STEM policy regarding subject provision and increase focus on the requirements and needs of females at post primary level, (Department of Education and Science 1995).
2. It would be beneficial in particular for policy makers to reflect on the needs of all-girls schools and STEM subject provision.
3. In order to facilitate changes required for female students so that they have the support to consider STEM subjects the Irish Government should review resourcing of guidance counsellors within post primary education. The cuts to guidance counsellors' hours introduced by the budget in 2012 should therefore be reversed in full.

With regards to practice it is recommended that:

1. Guidance counsellors work to inform parents and guardians early with regards to the options open to female students at post primary level. Parents that are better educated may be better able to support their daughters through subject choice and career decision making.
2. Guidance counsellors should work to increase their students' access to female role models in STEM whether that be teachers or those working in industry.
3. Guidance counsellors should encourage a whole school approach in their schools such organizing events and initiatives with STEM teachers.
4. Guidance counsellors should encourage self-reflection in their own practice to consider whether their personal beliefs are allowed to influence their student's subject choice and career decisions.
5. Awareness of gender stereotyping should be built included in teacher education programmes and guidance counsellor CPD.

With regards to future research it is recommended that:

1. It would be valuable to broaden research into all girls post primary schools in order to examine the reasons for female underrepresentation in STEM subjects at leaving cert level.
2. It would be beneficial to conduct research with the students themselves as to their motivations for choosing certain subjects at post primary level.
3. It would be advisable to further research the influence of parents or guardians on children with regards to subject and career choice.

6.4 Reflexivity

Conducting this research has provided me with insights into the perception of six guidance counsellors working in post primary education on the challenge in encouraging their female students to consider STEM subjects. Through both primary and secondary research I have gained a deeper understanding of the role of the guidance counsellor, the influence of gender and the influence of one's parents while in a post primary setting. I undertook this research while working in human resources in a multinational manufacturing company in Ireland. Part of my role included supporting those who work in science, technology and engineering. My awareness was heightened regarding the disparity of females versus males working in those fields. Through my research I've become more conscious of the influences that women face when choosing subjects at post primary level and how this can affect career choice.

My awareness of ethics has been heightened during the process of the research. The importance of ethics had been highlighted initially from the very beginning of the Masters course. This was done through for instance a module regarding research as well as the study of professional codes of practice such as the Institute of Guidance Counsellor's. The significance of integrity and confidentiality has now been ingrained in both my professional work and research.

6.5 Conclusion

This conclusion chapter has presented a summary of the findings in the context of the main aim and objectives of the research. The strengths and limitations of the study were outlined as well as recommendations in relation to policy, practice and future research. Finally the chapter included a reflexive analysis of the research process.

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Appendix A:



UNIVERSITY of LIMERICK
OLLSCOIL LUIMNIGH

Subject Information Letter (Research Participant - Interview)

Date

EHS REC no.:

Research Title: An exploratory study of the perception of guidance counsellors regarding the challenges in encouraging female students to opt for STEM (Science, Technology, Engineering and Mathematics) subjects at post primary level

Dear Volunteer,

I am currently studying the MA in Guidance Counselling with the School of Education, University of Limerick supervised by Tom Geary. As part of my studies I am undertaking a research project on the perception of Guidance Counsellors regarding the challenge in guiding female students to opt for STEM subjects. The benefits of taking part in this research include the fact that it could inform the work of teachers of STEM subjects, school managers and guidance counsellors.

This research will involve conducting qualitative research in the form of semi-structured interviews with guidance counsellors working with female students at post primary level in Ireland. Participation will be sought from guidance counsellors who are members of local IGC branches (Institute of Guidance Counsellors) in the West of Ireland. I am requesting your participation in the study in order to gather data regarding this subject. This would involve an audio-taped face to face interview with you to deepen understanding of the challenge of

guiding females to opt for STEM subjects at post primary level. The interview process will take approximately 40 minutes.

It is recognised by the researcher that the topic of career choice and the challenges of encouraging female participation in STEM subjects could be sensitive for some participants. Participation in this research is voluntary and participants can withdraw from the process at any time. If an individual does not wish to participate they will be thanked for their consideration and response. Their decline to participate will not be recorded or made known anywhere. If for any reason something goes wrong or the interviewee becomes upset the interview will be paused and the interviewee asked whether they wish to continue. If a participant at any stage decides to withdraw that recorded data will be deleted. If an interviewee requires support after the interview the researcher will advise appropriately.

The location and time for the interview will be agreed mutually prior to meeting. I will transcribe data from the interview. Pseudonyms will be adopted in the data and research in order to protect both the participants' identity and that of his/her school.

The results from this research study will be reported in my thesis and may be disseminated through professional publications. The collected data will be stored in a secure location approved by the University of Limerick.

If you have any queries or require further information on the research study, please contact me or my Supervisor:

Student Name: Kate Graham

Supervisor: Mr. Tom Geary

Email: 16104757@studentmail.ul.ie

Email: Email: tom.geary@ul.ie

This research has received Ethical approval from the Education and Health Sciences Research Ethics Committee (2018_03_14_EHS). If you have any concerns about this study and wish to contact someone independent you may contact:

Chairman Education and Health Sciences Research Ethics Committee
EHS Faculty Office
University of Limerick
Tel (061) 234101
ehsresearchethics@ul.ie

Appendix B:



UNIVERSITY of LIMERICK
OLLSCOIL LUIMNIGH

Subject Information Letter (Research Participant – Chair IGC)

Date

EHS REC no.:

Research Title: An exploratory study of the perception of guidance counsellors regarding the challenges in encouraging female students to opt for STEM (Science, Technology, Engineering and Mathematics) subjects at post primary level

Dear Chairperson,

I am currently studying the MA in Guidance Counselling with the School of Education, University of Limerick supervised by Tom Geary. As part of my studies I have undertaken a research project on the perception of Guidance Counsellors regarding the challenge in guiding female students to opt for STEM subjects.

This research will involve conducting qualitative research in the form of semi-structured interviews with guidance counsellors working with female students at post primary level in Ireland.

I am requesting your consent to carry out research with members of the IGC branch that you chair. This would involve audio-taped face to face interview with participants to deepen understanding of the challenge of guiding females to opt for STEM subjects at post primary level. The interview process will take approximately 40 minutes at a location and time agreeable to the participants.

I am requesting your permission to seek 6-12 volunteers for the interviews. Participation in this research is voluntary and participants can withdraw from the process at any time. The location and time for the interview will be agreed mutually prior to meeting. I will transcribe data from the interview.

Pseudonyms will be adopted in the data and research in order to protect both the participants' identity and that of his/her school. The results from this research study will be reported in my thesis and may be disseminated through professional publications. The collected data will be stored in a secure location approved by the University of Limerick.

If you have any queries or require further information on the research study, please contact me or my Supervisor:

Student Name: Kate Graham

Supervisor: Mr. Tom Geary

Email: 16104757@studentmail.ul.ie

Email: Email: tom.geary@ul.ie

This research has received Ethical approval from the Education and Health Sciences Research Ethics Committee (2018_03_14_EHS). If you have any concerns about this study and wish to contact someone independent you may contact:

**Chairman Education and Health Sciences Research Ethics Committee
EHS Faculty Office
University of Limerick
Tel (061) 234101
ehsresearchethics@ul.ie**

Appendix C:



UNIVERSITY of LIMERICK
OLLSCOIL LUIMNIGH

Consent Form (Research Participants)

EHS REC no.:

Research Title: An exploratory study of the perception of guidance counsellors regarding the challenges in encouraging female students to opt for STEM (Science, Technology, Engineering and Mathematics) subjects at post primary level

I have read the Volunteer Information Letter and understand the specifics of the research project. I understand that my identity and that of my employer will not be revealed at any stage in the reporting of the research study. The conditions involved in the research which are designed to protect the privacy of participants and respect their contributions are:

- i. Participation is completely voluntary.
- ii. Participants are free to withdraw at any stage in the process and any contributions made will be later destroyed.
- iii. The research interviews will be kept confidential and will be available only to the researcher and the supervisor. Excerpts from the interviews may be made part of the final research dissertation, but under no circumstances will names or any identifying characteristics be included.

I hereby agree to take part in Kate Graham's research study.

Signature: _____

Printed Name: _____

Researcher's Signature: _____

Date: _____

Appendix D:



UNIVERSITY of LIMERICK
OLLSCOIL LUIMNIGH

Consent Form (IGC Chair)

EHS REC no.:

Research Title: An exploratory study of the perception of guidance counsellors regarding the challenges in encouraging female students to opt for STEM (Science, Technology, Engineering and Mathematics) subjects at post primary level

I have read the Information Letter and understand the specifics of the research project. I understand that the identity of the participants will not be revealed at any stage in the reporting of the research study. The conditions involved in the research which are designed to protect the privacy of participants and respect their contributions are:

- i. Participation is completely voluntary.
- ii. Participants are free to withdraw at any stage in the process and any contributions made will be later destroyed.
- iii. The research interviews will be kept confidential and will be available only to the researcher and the supervisor. Excerpts from the interviews may be made part of the final research dissertation, but under no circumstances will names or any identifying characteristics be included.

I hereby give my consent for Kate Graham to carry out this research with members of the Galway IGC Branch:

Signature: _____

Printed Name: _____

Researcher's Signature: _____

Date: _____

Appendix E:



UNIVERSITY *of* LIMERICK
OLLSCOIL LUIMNIGH

Interview Guide

EHS Rec No:

Research Project Title: **An exploratory study of the perception of guidance counsellors regarding the challenges in encouraging female students to opt for STEM (Science, Technology, Engineering and Mathematics) subjects at post primary level**

Welcome: Thank you for taking part in this research. This interview should take approximately 40 minutes. As discussed participation in this interview is built on your consent. You may withdraw your participation at any time during the interview. You may also withdraw your participation up to the publication of my dissertation.

I am going to ask you some pre prepared questions regarding your perception on the challenge in guiding female students to opt for STEM subjects.

Questions

1. Can you tell me about your own background? i.e. how long have you worked as guidance counsellor
2. What would you consider the most important aspects of your role as guidance counsellor in guiding female student to consider STEM subjects?
3. What is your impression of the influence of gender on subject choice?
4. Do you perceive there to be a difference in the representation of boys and girls studying STEM subjects in this school/ in Ireland?
5. If you perceive there to be a difference in participation levels based on gender in those studying STEM subjects why do you think that is?
6. What issues do you believe female students face with regards to subject choice?
7. Do you think that there should be an onus on schools to encourage female participation in STEM subjects? If yes or no why?
8. Do you consider encouraging female students to undertake STEM subjects an important aspect of your role as Guidance Counsellor?
9. Do you find it challenging to encourage females to opt for STEM subjects? What do you think are the reasons for that?
10. What methods have you used to encourage female participation in STEM subjects at this school? Why have you used those methods? If you have not tried to encourage participation why is that?
11. What are the barriers for you in encouraging female representation in STEM subjects at this school?

12. Do you think that parents have an influence on whether or not female students opt for STEM subject?
13. Do you think that the WSAP to guidance counselling will support you in your role in relation to subject choice i.e. involving relevant teachers to talk about their subjects to year students
14. What more do you think could be done to encourage female representation in STEM subjects at post primary level?
15. Have you been offered the opportunity to attend training regarding STEM subjects?
Was it beneficial?
16. Do you have any other comments you would like to make?

Conclusion: The interviewer will thank the participation for their time and attendance. The researcher will stop the audio recording.