

# LETTERKENNY INSTITUTE OF TECHNOLOGY

## SCHOOL OF BUSINESS

### ASSIGNMENT COVER SHEET

<b>Student Name:</b>	Paula Breege Mc Bride
<b>Programme:</b>	Masters of Arts In Learning and Teaching
<b>Module:</b>	Dissertation
<b>Assignment Title:</b>	An investigation into the Influence of Affective Factors in Mathematical Performance in a Sample of Irish Post – Primary Pupils’
<b>Lecturer Name:</b>	Dr Joseph English
<b>Submission Date</b>	31/08/2016
<b>Word Count (if applicable)</b>	11218

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‘An investigation into the Influence of Affective Factors in  
Mathematical Performance in a Sample of Irish Post – Primary  
Pupils’.

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PGCE, BA (Hons)

Dissertation in Partial Fulfilment of the Requirements for the Master  
of Arts in Learning and Teaching

Presented to:  
Research Supervisor  
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Submission Date  
31<sup>st</sup> August, 2016

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## Abstract

‘An investigation into the Influence of Affective Factors in Mathematical Performance in a Sample of Irish Post – Primary Pupils’.

Paula Breege Mc Bride

The aim of this paper is to investigate the influence of affective factors in the mathematical performance in a sample of Irish Post-Primary Pupils’. Affective factors in mathematics are a popular topic of research for many in the educational sector. This is due to the fact that emotions, beliefs, motivation and attitudes are seen to influence on the mathematical achievement of pupil. This study measured the attitude of second and fifth year post-primary school pupils’ in a vocational school in Donegal. A total of 102 pupils were involved in this study, both male and female.

Participants overall attitude to mathematics was measured using The Fennema-Sherman Mathematics Attitude Scales (1976). It was found that the majority of participants, 79% in this research paper held an overall positive attitude to mathematics. Mathematical achievement results for participating pupils were gathered from school and used in order to establish if there was a correlation between overall attitude to mathematics and mathematical achievement. Data was analysed using SPSS software. Calculating the Pearson product moment correlation coefficient, showed a medium positive correlation between mathematical achievement and scores from the overall attitudinal scales. There was a positive correlation between the two variables,  $r = 0.327$ ,  $n = 102$ ,  $p = 0.001$ . Data analysis showed there was no significant statistical difference in the correlation results for male and females or second and fifth year pupils’. Findings did indicate that females in fifth year mathematic achievement result were more influenced by their overall attitude to mathematics. Mathematical confidence was identified as a key element to an overall positive attitude to mathematics. Conclusion from data are that more research needs to be done in to affective factors in mathematics and how this research can be used to raise the overall attitude to mathematics of pupils. It is also recommended that research in this area goes beyond its current level of calculating coefficients between mathematic attitudinal scales and mathematic performance, and explores meaning and uses behind these numbers in order to improve our education system.

## Acknowledgements

I would like to thank the following people who, without their help and cooperation, I would not have been able to complete this thesis:

My family and friends who supported me in my research.

My supervisor Dr, Joseph English, for his advice, guidance and constant help throughout completing this paper.

To the staff of LYIT in particular Joseph Carlin and Linda Burke for their help with technical support.

To the staff and pupils of Merville Community College.

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## **Chapter 1 – Introduction**

### **1.1 Background to Research**

As a teacher of mathematics, there is a constant spotlight on performance within the subject. The mathematical performance of our pupils are often reported on negatively in the media. However, on an international scale we are performing above-average. The Trends in International Mathematics and Science Study (TIMSS), which assess primary pupils' mathematic ability, in 2011, Ireland scored 527, the benchmark was 500. (Close, S. and Shiel, G. (2011)) The Programme for International Student Assessment (PISA), assess pupils at post primary level. Again Ireland scored above-average in this in 2012, with a standardised score of 501.5, the average of the other OECD (Organisation for Economic Co-operation and Development) countries was 494. (Eivers, E. and Clerkin, A. (2012)). This would suggest that our pupils are successful. There is however, a continued high rate of failure in mathematics at leaving certificate level, approximately 18% of student's each year (State Examinations Commission, 2016). This is a high figure and efforts must be made to understand why pupils are not achieving in mathematics. Are there factors that contribute to pupils reduced performance in mathematics? This paper will aim to examine if there are affective factors that influence the performance in mathematics.

### **1.2 Context in Literature**

The literature review in chapter two will examine how affective factors affect mathematical performance. It will be evident from the literature discussed that a positive attitude to mathematics contributes to a better performance in the subject. There is a large volume of literature that focuses on the teaching of mathematics and the material that is covered in the Irish curriculum. Cosgrove et al. (2004) examined the qualifications, experience and general attitudes of mathematic teachers in Ireland. Hourigan and O'Donoghue (2007) research focused on the subject knowledge of mathematics in primary and perspective primary teachers. The reform of the mathematic syllabus with the introduction of project maths was the focus of Lubienski (2011). However, there are very few Irish studies, which examine the role of the affective domain, even though it forms a basis of Bloom's Taxonomy (1956), which underpins

many educational theories. Anderson and Krathwohl's (2001) revised taxonomy, placed more focus on the affective domain. This is why the role of affective factors was selected as a topic to establish more knowledge in this field. Moohan (2012) and Nahari (2014) respective dissertations focused on the role of affective factors in Irish settings. Moohan's (2012) paper compares the attitudes of two junior cycle post-primary pupils' cohorts paying particular emphasis to the project mathematics reform and if teaching methodologies had an impact on attitude. Nahari's (2014) study focus is the attitude of first year engineering students. Attitudinal factors are examined in this, in order to find a solution to the failure rate in engineering, which is being attributed to the large amount of mathematical content in the course.

Internationally, affective factors in mathematics are widely studied, this will be evident in the literature review, however as noted there is a deficit of research in an Irish context. Thus, this research paper will contribute to the literature by examining the influence of affective factors in an Irish context. However due to the small scale nature of this study, the small participant sample and the research site being limited to just one educational establishment, generalisations will be limited and not reflective of the whole country. The professional motivation for the undertaking of this study is to understand affective factors that may contribute to reduced performance of pupils in the author's mathematical classes.

### **1.3 Research Aim**

The aim of this research is to investigate the 'Influence of Affective Factors in the Mathematical Performance of a sample of Irish Post – Primary Pupils'.

This will be achieved by the following research objectives:

- 1.To examine the literature in order to establish key affective factors that influence performance in mathematics.
- 2.To measure pupils' affective domain.
- 3.To investigate if there is a correlation between, the score of participants' affective domain and participants' achievement result.
- 4.To explore if the relationship between affective factors and achievement, differs between gender and age demographics.

Chapter 3 Research Methodology will examine how this objective will be achieved in more detail.

#### **1.4 Research Site**

The primary research site will be a co-educational, non- denominational post-primary school located in Donegal, that has a current pupil population of over 550 students. “The school draws its students from ten main feeder primary schools” (Department of Education and Skills, 2012). Offering the traditional Junior and Leaving Certification programmes, along with the Leaving Certificate Applied Program (LCA) and Leaving Certification Vocational Programme (LCVP), the school aims to cater for pupils with various needs and abilities.

The school is one of fifteen managed by Donegal ETB in the county. The research site is also one of twelve schools in Donegal and 190 post-primary schools in Ireland (Education.ie, 2015) that avail of the Delivering Equality of Opportunity in Schools (DEIS) programme. This programme helps address the educational needs of students from disadvantaged areas. In addition, it also requires schools to set targets aimed at increasing literacy and numeracy levels. As this study aims to look at factors that affect pupils’ performance in mathematics, it could be used in the identification of appropriate targets to improve numeracy.

#### **1.5 Structure of Thesis**

This paper is divided into six chapter. This chapter (one) is an introduction to the topic and the background to the research. Chapter two will examine literature surrounding the role of affective factors in mathematics. Chapter three will outline the research approach adopted in this paper. The results will be displayed in chapter four. Discussion and analysis of the results will be the content of chapter five. Chapter six will outline conclusions drawn from data analysed and make recommendation for application of results and further study.

## **Chapter 2: Literature Review**

Relevant literature on the topic of affective factors in mathematics and the influences these have in mathematical achievement will be discussed in this chapter.

### **2.1 Affective Domain**

“The affective domain refers to a wide range of beliefs, feelings, and moods that are beyond the domain of cognition” (McLeod (1992, pg. 576) Sparrow and Hurst (2010) noted that adults’ attitude to mathematics, comes from their experiences as children. They found that cognitive and affective domains both need to be nurtured. Walls (2001) work compliments this as it states that the affective domain must be examined in order to understand student’s attitudes. Attitudes are defined as positive or negative emotional dispositions (Aiken, 1976; Haji Boty et al., 2015; McLeod, 1992)

### **2.2 International Studies**

Haji Boty et al. (2015) investigated if pupils’ attitudes along with teachers’ style and study habits impacted on mathematical achievement. Participants were in second level education, aged between 14-16 years old. A questionnaire used was adapted from the Trends in International Mathematics and Science Study (TIMSS) 2011, thus provides validity to the instrument. However, with an extremely small sample size ( $n=37$ ), this questions the statistical significance of this study. Even though the sample population was sample results showed there was the correlation between mathematical achievement and a positive attitude was moderate,  $r=0.42$  and  $p<0.01$ , which shows this was a significant. Mohamed and Waheed (2011) article, focused on participants of the same ages as Haji Boty et al. (2015) with a sample size of 200 there was confidence in the findings. The metric used to measure achievement in this study, was a mid-term exam. Thus all participants did not sit the same test, so therefore the conclusion that this is indicative of the overall performance is inaccurate, this however is acknowledged in the work. It was found that those with an above-average mathematical ability, were found to be more confident in mathematics.

The hypothesis in Khine, Al-Mutawah and Afari, (2015) paper was that if students who liked, valued and were confident in mathematics this had a positive effect on their mathematical

achievement. Similarly, to Haji Botty et al. (2015) a questionnaire was developed from TIMSS (2011) report. As this study took place in a high school in a Gulf state, the questions were translated into Arabic, from English and the authors state that adjustment were made in order to suit the level of the participants. The article states that the translators were a panel of experts, this could alter the results, as the questionnaire were not administered in its original form and human errors may have being made in the translation. The hypothesis was accepted as there was a statistical significance using the Pearson's product-moment correlation coefficient,  $p < 0.01$  with  $n = 387$ . Kim, Park and Cozart (2012) also found a significant Pearson coefficient in their study. They examined if there was a correlation between final scores on an exam and pupils' motivation and emotions. Similar to Khine et al. (2015), Kim et al (2012) also used end of year assessments to measure against achievement.

Mohamed and Waheed (2011) explored student's attitudes to mathematics in a selected secondary school in the Maldives. They specifically examined confidence and usefulness in mathematics which Grootenboer and Hemmings (2007) identified as key factors that affect pupils' achievement in mathematics. This article identified that the factors influencing learners' attitudes in mathematics can be split into three categories. Factors associated with the student, those with the school, teacher and teaching and finally those by home and society. (Mohamed and Waheed, 2011, p278). was the instrument used in this study increases the validity of this study. In this study there was a sample size of 200, from year 9 and 10 of study. These were the same year groups selected by Haji Botty et al. (2015) and Khine, Al-Mutawah and Afari, (2015). Though the Maldives is seen as scoring low in mathematical ability, according to the Ministry of Education of Maldives (2011) 66.8% of pupils are below the expected level in mathematics, this research found the student's had high level of confidence in mathematics. Yilmaz, Altun and Olkun (2010) research among Turkish elementary pupils also found that although performance was poor, students held a positive attitude to mathematics. This would contradict the theory that low confidence, equated to poor performance. Nicolaidou & Philippou (2003) communicated that although Japanese students performed best on the (International Association for the Evaluation of Educational Achievement) IEA's Third Study of Mathematics, they were found to have a negative attitude towards mathematics.

Grootenboer and Hemmings (2007), researched background and affective factors that influence the mathematical performance of students. This article acknowledges that there has being an increase in the research completed in this area. Leder & Forgasz (2006), Schuck &



Grootenboer, (2004) both commented on the increased focus on research on the influence of affective factors in mathematical performance. The intention of this article was to examine if gender, ethnicity, social economic status and students' attitude towards mathematics have an impact on performance. The method used to examine these factors was a questionnaire, administered to pupils aged between 8 – 13 year olds. The questionnaire was a 3-part document, the first being general background information. The second being a Likert scale based instrument titled "Kids' Ideas about Maths' (KIM)" (Grootenboer and Hemmings, 2007, pg. 8). These questions were included; however, those used for the part 3 of the investigation were not. This would question the reliability of this element as it is not transparent, the questions could be leading or irrelevant. Results were analysed using SPSS software for part 2, how part 3 was analysed is not discussed in the paper. Four prevalent affective factors were identified through analysis "Positive View, Utilitarian Belief, Traditional Belief, and Maths Confidence" (Grootenboer and Hemmings, 2007, pg. 14). Of these the most significant were maths confidence and traditional belief. This would indicate that student's belief in their own ability and the view on the usefulness of mathematics in life, impact on how they achieve. Grootenboer and Hemmings (2007) research also support a large body of research that has been completed on if gender affects performances. What was interesting here is that teachers tend to rate males above females in mathematic ability also. Limitations of this study were that the instrument of analysis, the KIM as mentioned above had not been previously used, which again would question reliability and validity of the results.

Mji and Makgato (2006) study focused on factors affecting performance in South Africa. They identified that there were both direct and indirect influences on students' performance. Studies in South Africa paint an unfavourable picture of mathematics. This article aimed to establish factors that contributed to this problem, factors educators and "learners perceived to be associated with their poor performance" (Mji and Makgato, 2006, p. 257). A multi-method approach was used to gain insight. Focus groups followed by one to-one interviews, were used in this research. The multi-method approach adopted here, was due to the lack of data provided by the initial methodology. Only schools in the region with poor performance were selected for this research. This would question reliability, as you are only getting viewpoints from a negative aspect. A similar bias was shown in Ireland's 2012 PISA study as fewer lower performing schools, were selected than in previous years. (Perkins et al. (2013)). Motivation and interest was one of the five direct influence factors identified as an influence on performance.

### **2.3 Irish Studies on affective factors influence on achievement**

Liston and O'Donoghue (2007) research sample was first year students in the University of Limerick, who's course contained mathematics. A likert scale questionnaire was developed and piloted on leaving certificate pupils'. The finalised questionnaire was administered to 607 participants. Enjoyment in mathematics and value of mathematics, were the affective factors examined in this study. Both enjoyment and value were found to have a positive correlation with mathematic ability. "All 249 correlations were statistically significant ( $p < 0.01$ )" (Liston and O'Donoghue, 2007, pg 249). This research is backed by Aiken (1974) finding that students who held a high value of mathematics, had a better ability in the subject. Nahari (2014) research also focused on third level students, in this study first year engineering students were the population. The instrument for measuring students' attitudes was developed from previous studies (Jeffes et al., 2013; Breen, Cleary and O'Shea, 2009; Fadali, Velasquez-Bryant and Robinson, 2004), thus ensuring more confidence in the results as these had been reviewed before. Nahari (2014) interest was in measuring students' attitude towards mathematics and their ability, which was measure through a test covering the key topics covered of leaving cert. Nahari (2014) noted that although there was a relationship between attitude towards mathematics and achievement in mathematics, that this was not the focus of the study, so correlation results were not recorded. Thus no statically significant can be examined for this study without this data. Moohan (2012) research sample population was second year post-primary pupils in five secondary schools. This study was a comparison of two cohorts, n=128 and 138 respectively. Both cohorts, reported no statistically significant correlation between enjoyment in mathematics and value of mathematics with achievement in mathematics. This is conflicting to Liston and O'Donoghue (2007) results above.

### **2.4 Gender and Attitude**

Mohamed and Waheed (2011), research found no gender difference in attitudes towards mathematics. However, Effandi and Normah (2009) found that students of both gender believed males where more successful in mathematics. Patterson et al.'s (2003) research backed this finding, stating that males' pupils held a more positive attitude to mathematics than females. Mohd, Mahmood, & Ismail (2011, pg. 53) found "that there is no significant difference between gender and attitude", however results in the research may be skewed as the sample was made up of 70% males and 30% females. Hodgen et al. (2010) looked at student

attitudes to mathematics of pupils in England. Again a gender gap was evident, with males being more self-confident in the area of mathematics. Kyriacou and Goulding 2006, Elwood and Comber 1996, Woodrow 1996, Dweck 1986, 2000 all reported on a lack of confidence among young girls in the area of mathematics and that girls are more likely to suffer from maths related anxiety. These studies all focused on pupils in second level education. Hembree (1990) noted the females more often suffer maths anxiety than males. Ashcraft and Kirk (2001), Faust et al (1996), Ashcraft and Faust (1994), LeFevre, Greenham, & Waheed (1993) all produced findings on how those who suffered from a high level of mathematic anxiety, performed lower than those who were confident in mathematics.

## **2.5 Age and Attitude**

Hodgen et al. (2010) found that student's attitudes to mathematics got more negative as they got older. Tebbutt (1993), Matthews and Pepper (2005) also found in relation to England that students were not motivated to study mathematics past GCSE level as they could not see the usefulness of it in life. This supports Grootenboer and Hemmings (2007) traditional belief that if students could value the use of mathematic outside the classroom they achieve higher in the discipline. Ma & Kishor (1997) noted that as pupils got older their attitude towards mathematics became less positive, especially as pupils progressed in high school. Köğçe et al. (2009) found that pupils' attitude decreased as they progressed in education, especially in terms of 6th grade to 8th grade. Nicolaidou and Philippou (2003) established that the reason behind this may be due to the result of repeat failures, when pupils begin secondary education, they may have experienced failure less thus have a more positive attitude. Mata, Monteiro and Peixoto (2012) also back this claim that attitude becomes more negative as pupils' progress in secondary education.

## **2.6 Definition**

Martino and Zan (2010), Grootenboer and Hemmings (2007), Hart (1989), Leder (1985) have all discussed the lack of a clear definition for the affective domain. McLeod (1989, 1992 and 1994) argues that the affective domain in mathematics includes emotions, attitudes, and beliefs. Tirosh's(1993) definition supports this. Grootenboer's (2003) illustration below attempts to encompass a definition of the variables to be considered as affective factors. Affective factors can be defined as attitudes, emotions, values of believe that influence performance, Grootenboer's (2003)

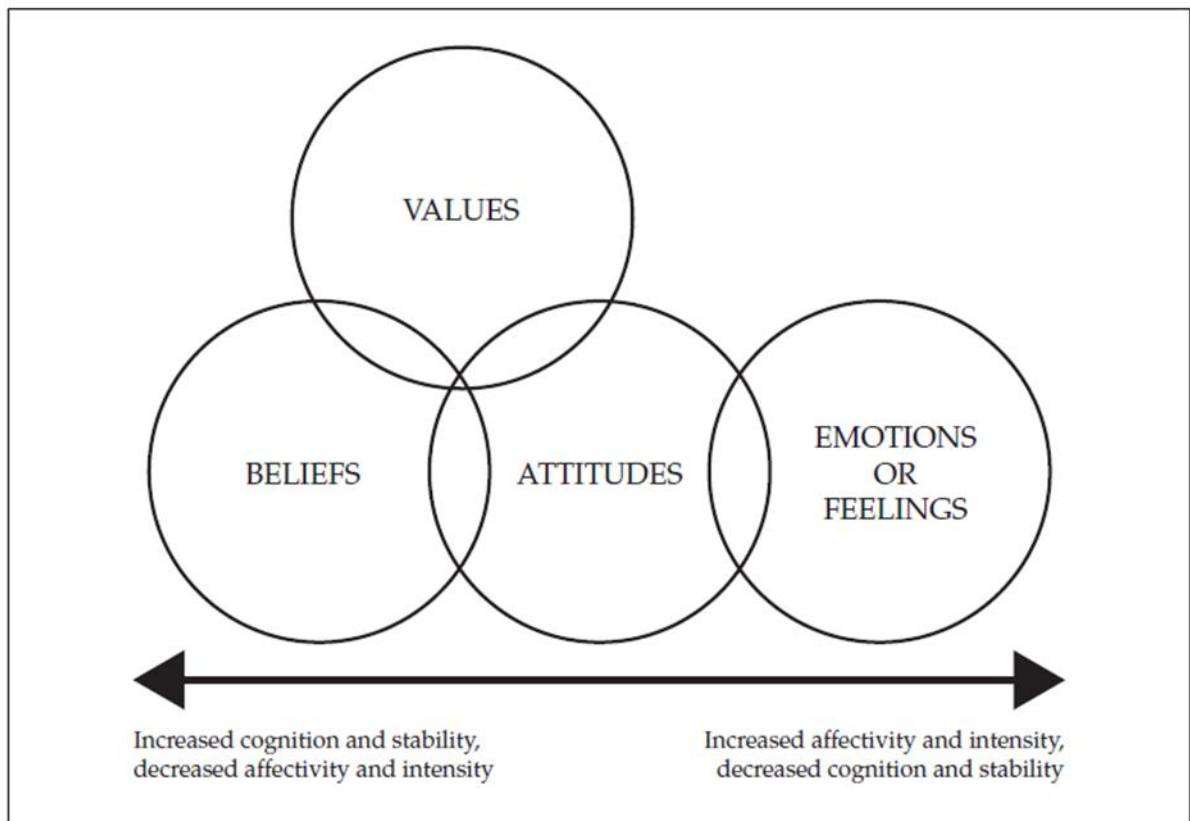


Figure 2.1: Venn Diagram of Affective Domain Grootenboer (2003)

This study will examine if pupils' attitude, confidence, motivation, anxiety and perceived usefulness of mathematics has an impact on their performance. These factors have been chosen as in the above literature review they are the commonly discussed factors that influence performance.

These studies along with many others will help form the research methodology and outline an approach for achieving the objectives of this paper.

## **Chapter 3: Research Methodology**

This chapter will explain how the research objective of this study will be met. This will include how each objective will be achieved, followed by a review of the researcher's chosen methodology using Saunders et al (2009) 'Research Onion' to provide a framework for the research methods.

### **3.1 Research Aims and Objectives**

The aim of this research is to investigate the 'Influence of Affective Factors in the Mathematical Performance of a sample of Irish Post – Primary Pupils'. This will be achieved by the following research objectives.

1. To examine the literature in order to establish key affective factors that influence performance in mathematics.
2. To measure pupils' affective domain.
3. To investigate if there is a correlation between, the score of participants' affective domain and participants' achievement result.
4. To explore if the relationship between affective factors and achievement, differs between gender and age demographics.

Figure 3.1 below illustrates how the overall research aim will be achieved, as stated above this will be done through meeting the research objectives.

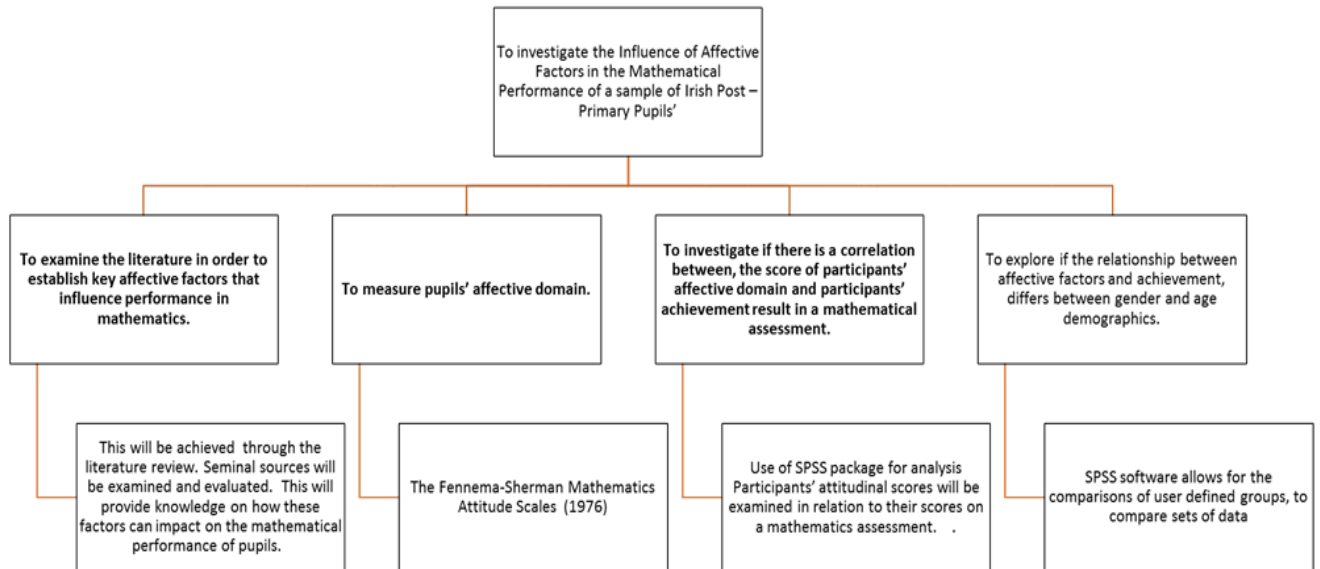


Figure 3.1 Flowchart of how research aims will be achieved.

The literature review in chapter two, of this paper, examined the literature, investigating and establish key affective factors that influenced pupils’ performances. Pupils’ affective domain will be measured using The Fennema-Sherman Mathematics Attitude Scale (1976). The selection of this tool to measure respondents’ attitudes will be discussed later in this chapter. As illustrated above in Figure 3.1 research objective three and four will be achieved through the use of a computer package called SPSS (Statistical Package for the Social Sciences). Use of this package will be explained later in this chapter.

### 3.2 Philosophy

To systemically organize the research methodology of this paper it an established framework will be used to provide structure. The ‘research onion’, as illustrated below Figure 3.2 was developed by Saunders et al. in 2007. This illustration provided a framework of the stages to be covered in order to have an effective process. Although established for business, it can be adapted to suit various disciplines. Bryman (2012) noted that it can easily be adapted to social research.

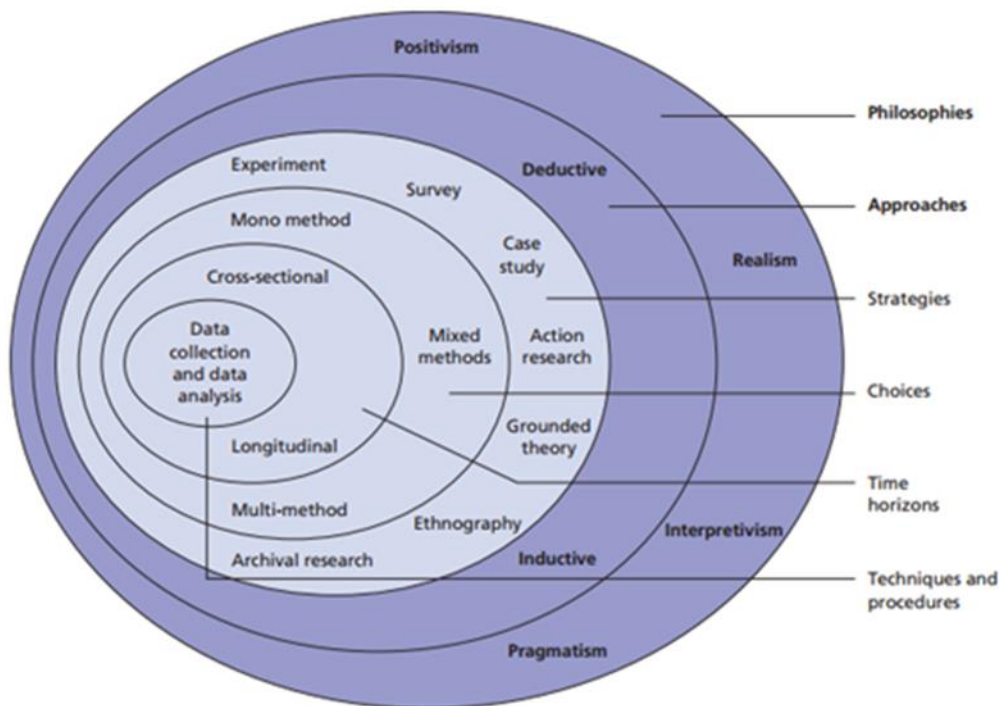


Figure 3.2 Research Onion (Saunders et al, 2009)

From the outer layer, the research philosophy adopted in this proposal will be discussed first. In deciding on one's paradigm, the authors ontology and epistemology must be observed. "Simply put, one's view of reality and being is called ontology and the view of how one acquires knowledge is termed epistemology" (Mack,2010, pg. 5). This leads the researcher to consider adopting a Positivistic approach. The term coined by French philosopher Auguste Comte (Beck 1979), positivism, is also described as the scientific approach. "Positivistic research tradition dominant in educational research" (Eisenhart, 1988, pg.102) "Positivism is the term used to describe an approach to the study of society that relies specifically on scientific evidence, such as experiments and statistics, to reveal a true nature of how society operates". (Study.com, 2015) As the basis on this study will be the gathering of quantitative data, statistical analysis will be used. Positivism is not without its critics, Yu (2003) stated that it is not the only choice for quantitative research and post – positivism may be more applicable. Golafshani (2003) discussed how reliability and validity are key elements of a positive approach to research. As this study hopes to produce reliable data, this factor helped in the establishment of a positive approach. Myers (1997) and Orlikowski & Baroudi (1991) both found that the positivist paradigm is suited to measurable variables, testing a hypothesis based

on a phenomenon and drawing conclusions from a sample population. Therefore, this is the correct approach to answer the research questions in this study.

### **3.3 Approach**

Golafshani (2003) stated that when a positive approach is adopted this leads to deductive reasoning. An epistemological assumption, related to positivism is that research tends to be objective and deductive in nature. The justification of why this research paper, is objective and deductive will now be examined. As theories have been examined in the literature and questions posed based on these. As the motivation for this study came from wanting to know why students are not succeeding, it was derived from a research problem. Gray (2004, pg 6) found “deduction begins with a universal view of a situation”. As this research began with probing affective factors in the literature review, a comprehensive situation was analysed. Gray (2004) also found the deductive approach is used normally in experimental research and used to discover a relationship between variables. Glaser (1992) argues that the deductive process is used when the researcher takes a ‘neutral’ position. Shanks (2002) noted that a positivist, deductive approach is commonly paired. Wiles, Crow and Pain (2011) found that deductive research is based on testing if your sample fits expectations discovered through previous research. This study is examining if there is a correlation between achievement and affective factors, to inquire if the results are similar to previous studies.

### **3.4 Strategy**

Cohen et al (2007, pg. 205) states “surveys gather data at a particular point in time”. This is true for this research study as this research is cross-sectional, due to time constraints. Saunders et al (2009) discusses how surveys tend to be associated with deductive, exploratory and descriptive research, as these tend to allow the gathering and analyses of data from a sizable population. These factors indicate that surveys and in particular a questionnaire are the best method to answer this paper’s research question. Bernard (2002) highlighted that the use of surveys in research goes back 200 years and how it became the most prominent research tool in the mid 1930’s with the introduction of sampling. Thus this is a method that has been trialled for a long period of time, providing reliability in research. The choice of surveys as a suitable method for the investigation in this study is also supported by Holden & Lynch (2004)



and Remenyi et. al (1998) research in which they respectively found that surveys are linked too positivistic, deductive, quantitative research.

### **3.5 Reliability and Validity**

Hinkin, (1998) explained how the reliability and validity of questionnaires in research tends to be a problem. To increase the reliability of this research a peer-reviewed instrument will be used. "Peer review can be described as the critical evaluation of a specific aspect of a practitioner's performance by professional colleagues, preferably achieved through use of a reliable and structured instrument." (Mc Kay et al.,2007 pg. 150) As affective factors are being measured a scale is required. Cook et al. (1981) and Kerlinger (1986) stated that the Likert-type scale is the most common used in behavioural research. Likert (1932) developed a five-point scale with a neutral midpoint. As the study of examining the relationship between mathematical performance and factors that influence learners' attitude toward the discipline has spanned decades many scales have been developed, relating to this topic. Dutton (1954), Gladstone, Deal and Drevdahl (1960), Aiken and Dreger (1961) Aiken (1974), Fennema-Sherman (1976), Michaels and Forsyth (1977), Sandman (1980), Richardson & Suinn (1972), Plake & Parker (1982) and Wigfield & Meece (1988) have all developed various scales throughout the years. In more recent years Galbraith, P., & Haines, C. (2000), Fogarty et al. (2000) Tapia, & Marsh (2004) and Pierce et al (2006) have all developed scales to measure various affective factors related to Mathematics. These were all adapted from the Fennema-Sherman Mathematics Attitude Scales (1976). However, they have only focused on one factor that influences the student's attitude towards mathematics. Mathematical results also had to be collected in order to examine if there was a relationship with the respondents attitudinal scores. The mathematical achievement results were gathered from the research sites database; these results were from the school's standardised November exams. Pupils' sat an exam based in accordance to what level they were studying mathematics at; higher, ordinary or foundation level. These exams were developed by the school's mathematics department, based on previous state examination questions. As these questions are previous state examination questions, they are of a trialled and of an approved standard for the level of study of the pupils'.

### **3.6 Data Collection Instrument**

In this study the Fennema-Sherman Mathematics Attitude Scale (1976) will be used. This is due to the fact that other researchers have based their scales on this. The Fennema-Sherman Mathematics Attitude Scale (1976) has been tried and tested frequently in other studies. (Ren, Green and Smith, (2016), Kalder and Lesik, (2011)). Tapia & Marsh (2004) noted that “it has become one of the most popular instruments used in research over the last three decades”. Meyer & Koehler (1990) stated this also. The scale consists of 108 questions on 9 scales which could be used independently. The full scale can take up to 45 minutes to complete. (Tapia & Marsh 2004).

“The Fennema-Sherman Mathematics Attitude Scales consist of a group of nine instruments: (1) Attitude Toward Success in Mathematics Scale, (2) Mathematics as a Male Domain Scale, (3) and (4) Mother/Father Scale, (5) Teacher Scale, (6) Confidence in Learning Mathematics Scale, (7) Mathematics Anxiety Scale, (8) Motivation Scale in Mathematics, and (9) Mathematics Usefulness Scale.” (Tapia and Marsh II, 2004) As this research paper is only interested in pupils’ attitude, the parents and teacher scales were eliminated. Also the research aim of this study is interested in examining difference in attitude based on gender, not if respondents viewed mathematics as a male dominated subject thus this subscale was not included. For this study a modified shortened version using only five of the scales will be used. This is contained in Appendix A, which is the questionnaire given to participants.

### **3.7 Choices**

Like Grootenboer and Hemmings' (2007) paper, the questionnaire in this research will be in 3 parts. Part A contains general background and categorising questions and Part B presents The Fennema-Sherman Mathematics Attitude Scales. Part C, involves explorative questions to gain more insight into the pupils. (Appendix A) This questionnaire will be the only method used for data collection in this study. This means that the choice of this study is mono-method, Bryman (2012) As the main purpose of this study is to examine if there is a correlation between achievement and affective factors, the questionnaire will provide sufficient information. The additional qualitative information that will be provided will be used to explain, some of the quantitative results and provided further information to help understand learners’ motivations.

This will only be used if insufficient data is gathered in the attitudinal scale. This rich data will be examined by looking themes and patterns, however the qualitative data should provide the majority if not all the findings of this research paper. Bryman (2012) described this as multi-method approach when one instruments, provides both quantitative and qualitative results. This study is cross-sectional. It will survey the pupils at one particular time. Lindell & Whitney (2001) stated that cross-sectional studies are vulnerable as the results particular in terms of behavioural studies can be affected by the participants' current mood. However, within the timeframe allocated for this research, a longitude study would not be practical. Although, possible it would not be practical in the time frame to do a census of the whole school.

### 3.8 Sampling

Figure 3.4 below is a breakdown of the school population including only the second and fifth year groups. The total population for this study is 209 as only second and fifth year groups were considered. Flick (2009) stated that the larger the sample size the more accurate the results. However, it is also observed in this article that any less than 30 will skew results. Delice (2010, pg. 2008) also found that "If the research has a relational survey design, the sample size should not be less than 30". Cohen et al (2000) also found that 30 was the minimum in each group from a sample for comparison. Pallant (2010) also noted that this was the required minimum number of participants for SPSS package analysis which will be used in this research. In order to ensure there is sufficient data to allow for non-respondents, the aim will be to survey 45-60 participants, in each year group

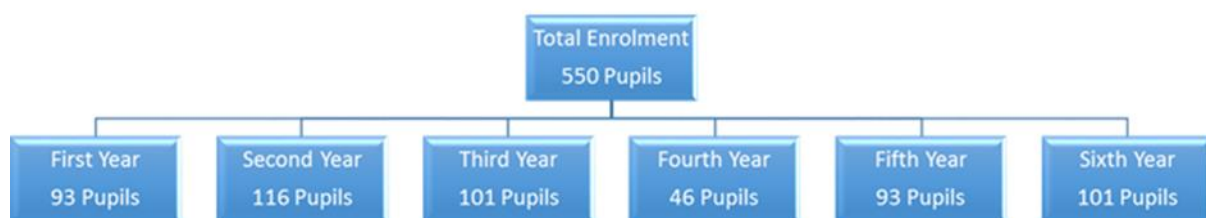


Figure 3.3 Breakdown of school population.

Maxwell (1997, pg. 87) defined purposive sampling as sampling in which “particular settings, persons, or events are deliberately selected for the important information they can provide that cannot be gotten as well from other choices’. The participants in this research will be a convenient sample, as the research site which they are selected from is the researcher’s place of employment. The sample frame for this study will select participants from second and fifth year. These groups were chosen to be representative of both junior and senior cycle. Assess could not be granted for exam years thus eliminating third and sixth year. First year were not selected as they may not have fully made the transition from primary to post-primary mathematics. As fourth year follow the transition year programme, it is different to all other years so would not be an accurate representation of the mathematics syllabus.

Cluster sampling was used, as rather than random selecting specific student, classes of student will be selected. In second year there are five class groups and four class groups in fifth year. This will speed up the data collecting process and also reduce bias, as individual pupils are not being selected. In the school, pupils all have a form class which is mixed in ability and gender. The aim will be to have a roughly equal number of males and females to compare their results. By selecting classes in this manner you are ensuring all student abilities are represented. Class groups will be placed in a hat and names and chosen at random, three groups will be selected from second year and two groups from fifth year. The questionnaire will also be administered by another teacher; thus the opinion of the researcher will not affect the results. Teddlie and Yu (2007) noted that cluster sampling is common in educational research, as cluster sampling naturally occurs in schools. This means that the questionnaire will be group administrated, thus there will be a low level of unresponsiveness.

### **3.9 Data Analysis**

Fennema–Sherman Mathematics Attitude Scales (1976) provides a coding system for analysing the results. This categorises the response attitudes in terms of positive or negative. Questions are rated between 1 and 5 for each question. This is included in Appendix B. Participants’ responses will be entered in SPSS (Statistical Package for Social Science) programme. A computer package was used in the analysis of data as it reduces errors, organise data, has graphing utilities and allows more in-depth analysis. Arkkelin (2014) has observed that SPSS has become the most popular statistical package used in academic and business

circles. Thus SPSS will provide is suitable as a data analysis tool for this study. “Categorical variables take on values that are names or labels” (Stattek.com, 2016) Categorical data collected in Section A of the survey will be used to compare results based on gender and year of study. These are nominal variables as there is not set ranking order for male or female. As the main focus of this study is the correlation between affective factors and achievement, the data is quantitative. The affective data in Section B of the survey was entered as continuous data in SPSS as Likert type scales were taken to approximate data measured at interval or ratio level of measurement. This “approach assumes that the dependent variable is measured at the interval or ratio level, that is, using a continuous scale rather than discrete categories.” (Pallant,2010, pg. 197) Data will be analysed and presented using charts in this study. Pallant (2010) steps on screening and cleaning data will also be follow, these are used to find errors in the input of data. The maximum and minimum vales of each section will be examined, if any value falls outside the assigned range, an error will be shown. If any outliers are found, the corresponding survey will be consulted and the error fixed.

### **3.10 Ethical Considerations**

The majority of participants will be under the age of 18 years; stringent ethical guidelines must be followed. As a registered member of The Teaching Council of Ireland and a practicing teacher in the research site, Gardaí Vetting to work with children is already in place.

“Written consent should be obtained from parents, in cases where children are under the age of 18.” (Whyte, 2006, pg. 4) In order to comply, all parents’ whose child was select to participate received a letter, Appendix C. This letter explained what is being researched, how their child has been selected, how the results would be used, how they will be stored and who will have access to them. British Educational Research Association (2011), states that all of the above are important components of informed consent. In order to comply with The United Nation Convention on the Right of the Child Article 12, consent was also sought from the pupils, as they are capable of forming their own views, Appendix D

Permission of a gatekeeper in this case, the school principal was also required. Written consent was sought and received. Pupils were made aware that there will be no negative consequence

for not participating, or benefits for taking part. This is particularly important given that this researcher is also a teacher in the school. Given this dual role it is important that undue influences are not asserted over the pupils. Fueyo & Koorland (1997) and Henson (1996), discuss widely the role of the teacher as the researcher. University of Victoria (2008) published guidelines for those in this position, it is discussed that having a third party, where appropriate distribute any document, help reduce this bias.

British Education Research Association (2011), notes that there may be confidentiality issues related to the teacher being the researcher. Every effort will be made to protect the confidentiality and anonymity of each participant. In compliance with the Data Protection Amended Act 2003, all data will be stored in a locked cabinet, all digital information will be stored on a private, password protected laptop and be destroyed within an appropriate timeframe. All participants will have the right to withdraw. All LYIT guidelines will be adhered to in terms of ethics. Pupils' names will not be on their questionnaires all will be assigned a random number, which will be corresponding to their result. This is to protect the anonymity of participants at all times, the list of names corresponding to participant number will be stored separately. Ethical consent forms submitted to LYIT, which were approved are contained in Appendix E.

Department of Children and Youth Affairs, (2012, pg12) states that "every effort to ensure that positive change for children is an outcome of the research." University of Victoria (2008) also highlight this, in their guidelines, that there must be more benefit than harm to the participants, when they are your pupils. This research has the possibility of improving teaching and learning with research classroom, therefore is justified.

## Chapter 4: Results

This chapter will outline the key results gathered from the questionnaire administered to participants. The questionnaire was administered to both a representative random sample of 2nd and 5th year pupils as discussed in the previous chapter. Analyses of the data was done using SPSS software. Following cleaning and screening the data for errors as discussed in the previous chapter, reliability of the data was ensured.

### 4.1 Reliability of results

“Cronbach’s alpha is a measure used to assess the reliability, or internal consistency, of a set of scale or test items.” (Goforth, 2015). The cronbach’s alpha was calculated for the overall attitudinal scale, the value was 0.947, when all 60 items of the scales were included. Pallant (2005) stated that values above 0.7 are considered reliable, thus the internal reliability of this scale is very strong, thus results produces are valid. All 5 subscales individually reported a Cronbach’s Alpha value greater than 0.8, thus each are reliable on their own also.

### 4.2 Descriptive Analysis

There was a total of 102 valid respondents. Of the 102 respondents there were 48 males and 54 females. 55 of the sample was in second year while 47 in fifth year.

The below bar chart in Figure 4.1, shows the gender breakdown for each year group. In terms of level of study, 58 studied mathematics at higher level, 43 at ordinary level and 1 respondent studied foundation level. With only one participant studying mathematics at foundation level, this cohort is not represented in this study.

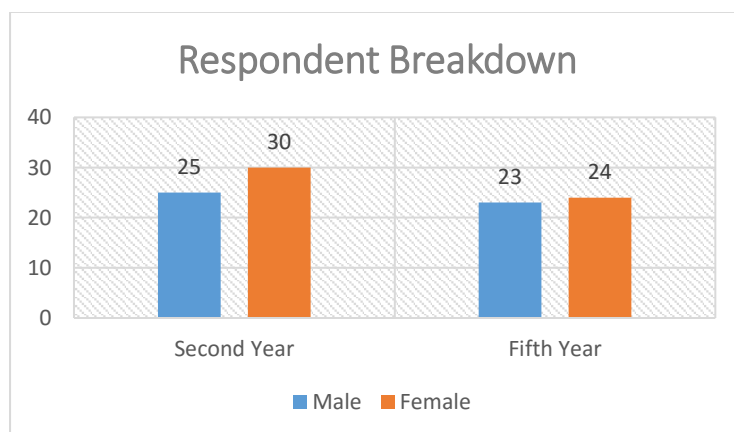


Figure 4.1 Respondent Breakdown

The average result for the participants in their mathematical assessment was 57%, with a standard deviation of 20%. This was on the November test administered to all pupils in the year, prior to the administration prior to this study. With a minimum result of 6 and maximum of 91, there are both high and low performers included in this study.

### 4.3 Attitudinal Scale Results (Research Objective Two)

As discussed in the previous chapter a respondent's affective domain was measured focusing on five key factors: attitude towards mathematics, mathematics anxiety, and perceived usefulness of mathematics, confidence in mathematics and motivation in mathematics. The highest possible score on the questionnaire containing the modified version of the Fennema Sherman Attitude Scale (1976), was 300, as each of the five scales had 12 questions each with a maximum score of 5 this was determined by the pre-established rating scale. The average score of pupils on the full attitudinal scales in this study was 209, with a standard deviation of 35. The maximum value was 271 and minimum value of 124, this shows that this sample population has a diverse attitude towards mathematics. Figure 4.2 below illustrates the scores received by pupils' in the overall attitudinal scales. It can be observed that the most participants scored between 180-239. The significance of scoring above 180 will be highlighted in the discussion section in the following chapter,

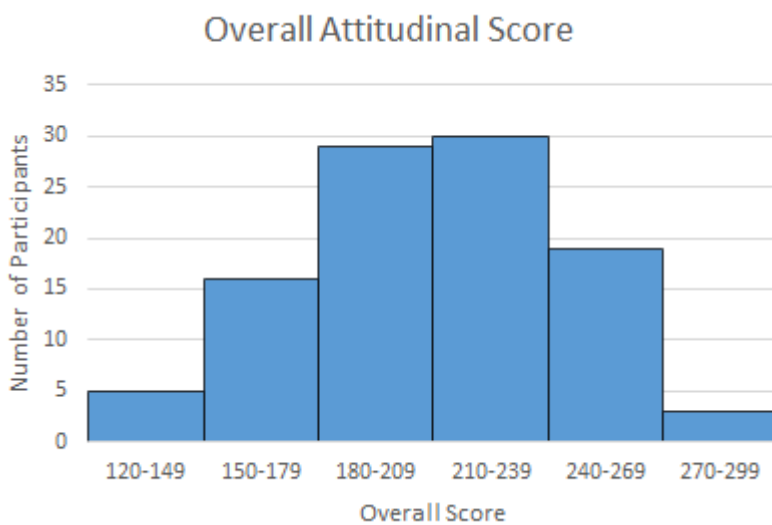


Figure 4.2 Overall Attitudinal Score group frequency.



Table 4.1 below shows the breakdown of data, based on gender and age. It can be observed that in terms of gender, the mean overall attitudinal score does not differ greatly.

Group Statistics					
Gender		N	Mean	Std. Deviation	Std. Error Mean
TotalScale Score	Male	48	210.2917	36.09265	5.20952
	Female	54	208.2407	34.41913	4.68385
Year					
TotalScale Score	Second Year	55	225.2364	29.30552	3.95156
	Fifth Year	47	190.4468	31.98900	4.66607

Table 4.1 Overall Attitudinal Score divided by gender and year.

Further breakdown of the above statistics when data was organised into gender and year produced the following results for overall attitudinal score mean: second year male = 227, fifth year male = 193, second year female = 224 and fifth year male female = 188. These results indicated that attitude becomes more negative, as pupil's progress in education. This will be discussed in the following chapter.

The mean score on each of the five individual scales was calculated: Attitude Scale = 48, Anxiety Scale = 41, Confidence Scale = 41, Motivation Scale = 36 and Usefulness Scale = 44.

#### 4.4 Correlation Results (Research Objective Three)

A Pearson product-moment correlation coefficient was computed to assess the relationship between pupils' percentage on their mathematics exam and their score on the shortened Fennema Sherman Scale (1974) administered. There was a positive correlation between the two variables,  $r = 0.327$ ,  $n = 102$ ,  $p = 0.001$ . Figure 4.3 below illustrates this relationship, showing that although there is evident outliers, the data does form a positive pattern, indicating that in general that the higher the score on the attitudinal scales the higher the percentage achieved in the pupils' exam

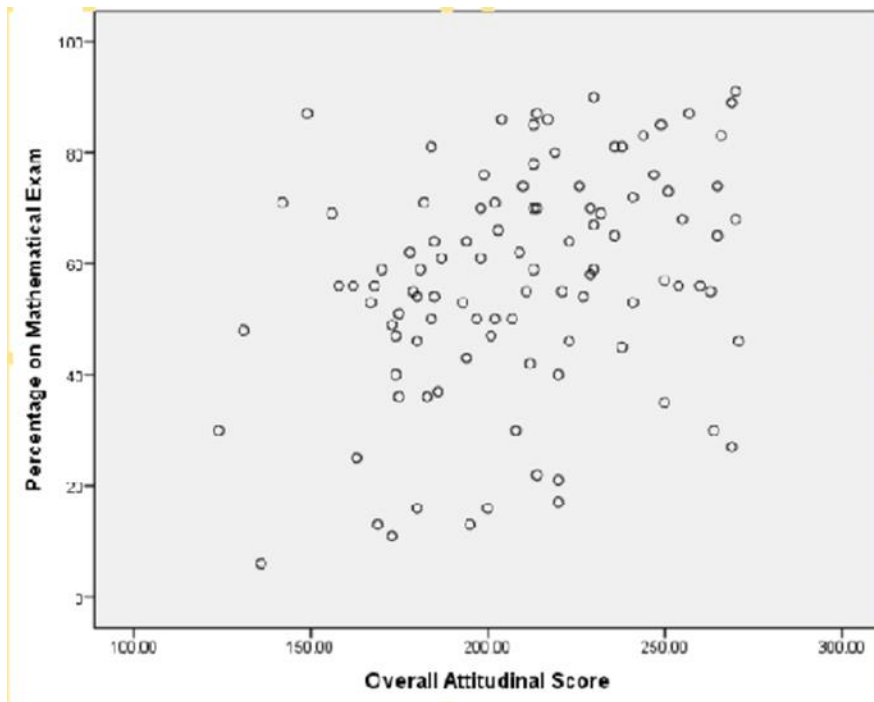


Figure 4.3: Scatterplot of Correlation between Overall Attitudinal Score and Percentage on Exam

The value of a Pearson correlation coefficient ( $r$ ) can take values from -1 to +1. The scatter graph above confirms that the correlation is positive. Pallant (2005) produces the below Table 4.2 to interpret the strength of the ( $r$ ) coefficient based on Cohen (1988) work. With an  $r$  value of 0.327, it can be concluded that the positive correlation is of a medium strength

$r = .10$ to $.29$ or $r = -.10$ to $-.29$	small
$r = .30$ to $.49$ or $r = -.30$ to $-.49$	medium
$r = .50$ to $1.0$ or $r = -.50$ to $-1.0$	large

Table 4.2 Correlation Strength Source: (Pallant, 2005, pg 126)

#### 4.5 Correlation Results split by gender and year. (Research Objective Four)

Splitting the data in terms of gender and year of study separately, the Pearson correlation coefficient was again calculated to examine if there is a relationship between pupils' percentage on their mathematics exam and their overall attitudinal score.

	N	r		N	r
Male	48	.379**	Second Year	55	.392**
Female	54	.282*	Fifth Year	47	.317*

Table 4.3 Correlation in terms of groups.

Pallant (2005) also noted that with a sample size greater than 100, a small correlation coefficient may be significant. Given  $n = 102$ , correlation is significant at the 0.01 level, reported by SPSS.

This appears to show that there is a weaker correlation for females on the tested variables. To examine if this is significant. The  $r$  values must be converted into  $z$  scores, as standard form score. This was done using the  $r$  to  $Z$  Fisher (1915) transformation method.

Males  $z = 0.399$ , Females  $= 0.290$ , from these we calculate the  $z$  observed value, to measure the strength of the relationship. For this data,  $z_{obs} = 0.53$ . Pallant (2005) states that if  $-1.96 < z_{obs} < 1.96$ , there is no statistical significance difference. Thus we can conclude since 0.53 lies within this interval there is no significance between the differences between the two correlation coefficients. Similarly, there is no significant difference in terms of year of study with a  $z_{obs} = 0.42$ .

However, when that respondents' data was reanalysed exploring gender alongside year of study, the results show that females in fifth year, had a Pearson correlation coefficient of  $r = 0.610$ . This was notably different, from their male counterpart with a  $r = 0.132$ . Yet this was not statistically significant.

All five scales correlation with pupils' achievement result, were also examined separately, their  $r$  values are shown in the table below.

	Anxiety	Attitude	Confidence	Motivation	Usefulness
Pearson Correlation	.314**	0.116	.348**	.208*	.215*

Table 4.4 Pearson Coefficient for Individual Scales

Of the five factors examined confidence in mathematics has the strongest correlation with mathematics achievement results for the 102 respondents. This appears to indicate that pupils' confidence in mathematics has the greatest influence on their achievement in the subject. Confidence in mathematics was observed to have the strongest correlation with pupils' achievement in fifth year females. This cohort had a significant difference from males of the same age with a  $z_{obs} = -2.04$ . Confidence explains significantly more of a difference in variance in negative affect for females than for males.

## **Chapter 5: Discussion of Findings**

This chapter will discuss the results from chapter four. With a respondent rate of 102, there was a sufficient sample number to allow for analysis. All subgroups used for analyses: male, female, second year and fifth year all had above 30 respondents, this was discussed in the literature as a minimum number required for comparative analysis highlighted by Cohen et al. (2010), Delice (2010) and Pallant (2010)

### **5.1 Discussion of Findings on the Attitudinal Scale Results**

*Research Objective Two: To measure pupils' affective domain.*

Attitudes towards mathematics, was measured using the Fennema Sherman Mathematics Attitudes Scales (1976). As the results shows a range of 147, this indicates a diverse group in the sample population. In the overall attitudinal scale administered, the maximum possible score was 300 and the minimum was 60. In the coding of the question a neutral view, or a response of no opinion/I don't know as it was labelled in the questionnaire (Appendix #####) received a value of three. Thus from this with 60 questions in total, a score of 180 in the overall attitudinal scale would be considered as having neither a positive or negative attitude. 81 of the 102 pupils' scored above 180 in the overall attitudinal scales. This would indicate that 79% of this sample had a positive attitude to mathematics. In the 2015, Programme for International Student Assessment (Pisa) results Ireland was ranked 15<sup>th</sup> of 76 global countries tested (Humphreys, 2015). This would indicate that Ireland is a high performing country in terms of mathematics. Khine, Al-Mutawah and Afari, (2015) and Yılmaz, Altun and Olkun (2010) respective research found that pupils in lower performing countries tended to have a negative attitude of mathematics. Thus in this research sample, the majority of participants had an overall positive attitude towards mathematics and Ireland is performing well in the discipline. This would suggest that pupils in higher performing countries have a more positive attitude in mathematics. This conflicts with Nicolaidou & Philippou (2003) findings, in Japan, which is ranked 5<sup>th</sup> in the same 2013 Pisa study, 10 places above Ireland, found Japanese pupils to have a negative attitude to mathematics.

## **5.2 Discussion of Findings on the Attitudinal Scale Results, with regards to age and gender.**

Comparing means of the subgroups, shows that in this sample there is no difference in terms of gender. This would contradict findings by Klinger (2008, pg. 199), there are “substantially poorer views of mathematics held by female students”, Patterson et al.’s (2003) study also highlighted that males had a more positive attitude towards mathematics. Results from this studies, illustrate that there was no differences in attitude to mathematics between males and females are similar to Mohamed and Waheed (2011).

Hemmings, Grootenboer and Kay (2010) found that females held a more positive attitude to mathematics than their male counterparts. However, it was notes as females got older their attitude became more negative. Analyses of the data provided from the overall attitudinal scales, does not confirm or contradict this claim. As shown in the results section of this paper there is no major difference in the overall mean scores for males and females, in fact males score 2 marks higher than females. However, when the data was split in terms of year group, there was a marked difference. The mean score for a female in second year on the overall attitudinal scale was 224, in comparison to a mean of 188 observed for fifth year females. This does lead to the interpretation that females’ attitudes, do decrease as the get older. Hannula (2002) research also accentuated this phenomenon, finding females attitude decreased as they progressed in education.

The results in the previous chapter also reveal that males’ attitudes decreased with age. This can be interpreted that regardless of gender as pupils progress in education their attitude to mathematics becomes more negative. There is a marked difference in means, when we examine the total score on the attitudinal scale, grouped by year of study. With a p value less than 0.01 observed, there is in fact a significant difference. Thus showing that as pupils’ got older, or progressed more in education their attitude towards mathematics became more negative. Ma & Kishor (1997), Hodgen et al. (2010) and Mata, Monteiro and Peixoto (2012) all found the decline in attitude as the pupil progressed in education. Martino and Zan (2010) findings suggest that attitude is never stable and that it is never too late to change an older students’ attitude to mathematics. Pepin (2011) study focused on second level pupils, in this study it was found pupils’ attitude to mathematics decreased in year 9, from a previous more

positive attitude in year 7 and 8. Interestingly it was found that pupils' attitude to mathematics increased again in year 10/11.

### **5.3 Discussion of Findings on Correlation**

*Research Objective Three: To investigate if there is a correlation between, the score of participants' affective domain and participants' achievement result.*

In this research paper a positive correlation was found between the results pupils attained on their mathematical assessment and on their score on the overall attitudinal scales. This tells us that pupils with a higher score on the overall attitudinal scale should perform better in their mathematical assessments. The more positive the attitude the better the results. Haji Botty et al. (2015) findings are similar to those in this research paper. Haji Botty et al. (2015) work found a positive correlation between pupils' mathematical achievement and having a positive attitude, reporting a Pearson correlation coefficient,  $r = 0.42$ . However, of the five factors measured on the overall attitudinal scale in this study, a positive attitude had the least impact on the overall result on the attitudinal scales, with a Pearson correlation coefficient of  $r = 0.454$  at the 0.01 level. Though statistically significant the other four factors examined; anxiety in mathematics, usefulness of mathematics, confidence in mathematics and motivation in mathematics all reported a higher correlation with the overall attitudinal score of pupils'

Interestingly of the five individual scales included in this study, confidence was found to have the biggest influence on the overall attitudinal scales. The Pearson correlation coefficient between the confidence scale and the overall attitudinal scale was  $r = 0.875$ ,  $p < 0.01$ . This is a significant relationship, indicating of the five scales included, having confidence in mathematics had the biggest effect on the overall attitudinal scale. Khine, Al-Mutawah and Afari (2015, pg. 207) found a "strong positive correlation between confidence and achievement". It was discussed in their article that an increase in confidence would have a desired effect on mathematical achievement. However, Guy, Cornick, and Beckford (2015) research highlighted a negative relationship between pupils' self confidence in mathematics at the beginning of a semester and their overall achievement. These studies along with the results from this paper would indicate that we require our pupils to be confident in mathematics in order to have a good overall positive attitude to the subject, but that too much initial confidence

can lead to failure. This may be due to those, who are over confident, not being motivated as hard to work, as they feel they are already achieving. However, this study does not establish this claim as it found that motivation and confidence, we highly related with  $r= 0.699$ .

#### **5.4 Discussion of Findings on Correlation with regards to age and gender.**

In the results sections it was observed that there was no significant find in the correlation difference between males and females. Data gathered from the population sample, showed the average female mathematic achievement results were higher. It was found that males had a more positive correlation between mathematical achievement and their overall attitudinal score. This contradicts the findings of Mubeen (2013), in which only the correlation between achievement and attitude for females reached a significant level. Further analysis of the results however revealed that there was no statistically significant difference between the correlation between mathematics achievement and overall attitudinal score for both genders. Devine et al. (2012) research also found that gender did not affect Pearson correlation coefficient in their study.

Analyses conducted by SPSS with the data, showed second year pupils score slightly higher on average than fifth year pupils in the mathematics exam, roughly 2% better. It was found that the younger pupils had a more positive attitude to mathematics, than those who had progressed further in education. Similarly, to gender there was no significant difference in the correlation among age groups. Nicolaidou and Philippou (2003) reserach found the same results as this research paper, in that age of participant did not have a significantly affect correlation results. White (1982) did find age affected achievement and attitude, however noted as students increased in age and into further education the magnitude of the effect diminished.

The data was organised by splitting the results in terms of gender and year together showed notably difference in the correlation results between mathematical achievement and overall attitudinal score. The strongest correlation was observed among fifth year females. Mata, Monteiro and Peixoto (2012) paper found similar results, finding that older females in their study, showed a stronger relationship between achievement in mathematics and attitude. Much research has been done in order to explain this phenomena, however no definite explanation emerges. Bryant, Yarnold, & Grimm (1996) indicate that we recognise the affect in females, as they are more honest about their emotions. Stipek and Gralinsky's (1991) ascertained that



females felt less pride in achievement in mathematics and more shame in failure leading to their achievement being affected more. It was noted in this study that confidence, especially in older females affected their overall attitude the most. The lack of confidence experienced by females in mathematics is affecting performance negatively.

### **5.5 Summary of findings**

The results discussed above indicate that in this sample of pupils the majority had a positive attitude to mathematics. It was found that for the participants in this study that a positive medium correlation was observed between mathematical achievement and overall attitude to mathematics. Although difference were noted examining the results focusing on gender and year of study, none were of a statistically significant value. The aim of this research was to investigate the ‘Influence of Affective Factors in the Mathematical Performance of a sample of Irish Post – Primary Pupils’’. This aim has being examined in this chapter and the previous, conclusions and recommendations which arose from this study will be explored in the following chapter.

## **Chapter 6: Conclusions and Recommendations**

This chapter will outline the conclusions drawing from the results presented in this paper and make recommendations for further research in the area.

### **6.1 What was ascertained?**

This paper aimed to measure pupils' affective domain. This was done using The Fennema--Sherman Mathematics Attitude Scales (1976). The participants in this study exhibited a positive attitude to mathematics over the five scales examined. No difference was found in terms of the attitudinal scores of males and females. This results did show that older pupils' attitude to mathematics was more negative than their younger counterparts. Martino and Zan (2010) research did highlight that attitude to mathematics is not inalterable, pupils' attitude can improve or decline.

In conclusion results from this research paper, confirm that there is a relationship between mathematical achievement and pupils attitudinal score. This is not a new contribution to research as many of the articles in the literature have referenced the correlation between mathematical achievement and pupils. It has been frequently noted that there is a positive correlation between these variables. In this study although the correlation was not as strong, as in other research it is still significant statistically. Although there was notable difference in terms of gender and age, the findings in this study were not statistically significant, to confirm that these characteristics affect correlation between mathematical achievement and overall attitudinal score.

### **6.2 What needs to be ascertained?**

Cretchley (2008) noted that there needs to be deeper research in to the role of affective factors and their influence in mathematic performance. It was stated that finding a correlation does not explain the impact of affective factors and research needs to go beyond these simplistic tests. It was also stated by Cretchley (2008) that research findings between performance and achievement vary widely. In order to make use of correlations findings one must examine what they mean. A positive correlation between mathematical achievement and attitudinal scores, means that as one variable increases, this is associated with an increase in the other. Thus if

pupils' overall attitude and view of mathematics could be improved, it hypothetically would improve pupils' results. This would indicate that if attitudes to mathematics could be improved this would have a positive impact on achievement within the subject. Johnston-Wilder (2013) found that attitude towards mathematics could be improved by building resilience among pupils, this would mean they would persevere when they found mathematics difficult. Ifamuyiwa and Akinsola (2008) found that cooperative learning can improve the attitude of senior pupils especially to mathematics. Johnson (2009) however found that cooperative learning had no real change in pupils' achievement, however moral and positivity in the classroom was increased.

### **6.3 Shortcomings of this study**

A major shortcoming of this study, was that the sample population, was from one school only and does not represent all post-primary schools in Donegal never mind Ireland. The research site, was a mixed gender, rural, DEIS post-primary school, with a homogeneous population. In order to be a representative sample, schools from various diverse backgrounds would need to be selected. Moohan (2012) selected a variety of post-primary schools from the different sectors: voluntary, vocational and comprehensive to ensure an adequate representative sample was included. In this research paper, only 5 scales within The Fennema Sherman Attitude Scale (1974) was used. Although each individual scale is independent on its own, to get an accurate holistic measure of pupils' attitude all nine scales should be used. The focus of the study, was to examine the influence of affective factors in mathematics on pupils' performance, by establishing if there was a correlation between mathematical achievement and overall attitudinal scores. This was achieved, however as discussed above in relation to Cretchley (2008), this is futile, as no further actions were taken with results. The results from this study, should be interpreted with caution for a number of reasons. Although there were 102 respondents in the survey, there were same numbers in the subgroups thus results may be biased. Analyses of results must be interpreted at a superficial level, especially when gender and year were examined in conjunction, as levels were borderline for statistical analysis.

#### **6.4 Applications of this study**

This study adds to the extensive volume of research done of the role of affective factors in pupils' mathematics performance. This paper adds to the current research by providing an insight in an Irish context. Although some studies as mentioned in the literature review have been completed in Ireland, it lacks behind a magnitude of research done internationally. This study has proved that pupils' overall attitude affects their mathematic achievements thus educators needs to improve practice to promote a positive overall attitude to mathematics. Senior females, were identified as the group most affected by the relationship between overall attitude and mathematic achievement, thus educators must apply this knowledge in the implementation of strategies targeting underperforming pupils. Confidence in mathematics was also highlighted a key factor, in a positive overall attitude, educator must try and build confidence in their pupils to help ensure success in their classrooms.

#### **6.5 Recommendations**

A recommendation of this study is that further research needs to be carried out on the influence of affective factors on mathematical performance of post-primary pupils focusing on those in the Irish education system. This study could be broadening and replicated by increasing the sample population to include participants from all school years and various educational establishments taking in all types of post-primary education. Further deeper research could also be carried out by testing all 9 scales of The Fennema Sherman Attitude Scale (1974). Improvements could be made to the reliability of results by administrating a set mathematics exam to all participants to ensure that achievement results reflect accurately for all participants. The findings of this research may be of interest to mathematical teachers, as they strive to ensure best practice to promote a positive attitude too mathematic. Educational bodies are recommended to develop strategies and targets to ensure groups identified in this study, who suffer from an adverse attitude to mathematics, are able to improve and build on their current attitude to achieve their potential in this subject.

The aim of this research is to investigate the 'Influence of Affective Factors in the Mathematical Performance of a sample of Irish Post – Primary Pupils'. Data collected and analyzed provide evidence that the majority of pupils sampled have a positive attitude too mathematic. Statistical analysis proved that there is a positive correlation between mathematical achievement and their overall attitudinal score, indicating an improvement in one

will have a positive effect on the other. Minor differences were found between gender and age, however alone none proved to be a determining factor in either mathematical achievement or attitude towards mathematics.

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## Appendix A

### Questionnaire

#### Section 1

Please tick the relevant box.

Gender:	<input type="checkbox"/>	Male	<input type="checkbox"/>	Female								
Year:	<input type="checkbox"/>	1st	<input type="checkbox"/>	2nd	<input type="checkbox"/>	3rd	<input type="checkbox"/>	4th (TY)	<input type="checkbox"/>	5th	<input type="checkbox"/>	6th
Maths Level:	<input type="checkbox"/>	Higher	<input type="checkbox"/>	Ordinary	<input type="checkbox"/>	Foundation	<input type="checkbox"/>	Common	<input type="checkbox"/>		<input type="checkbox"/>	
Average Grade in Tests	<input type="checkbox"/>	A	<input type="checkbox"/>	B	<input type="checkbox"/>	C	<input type="checkbox"/>	D	<input type="checkbox"/>	E	<input type="checkbox"/>	F

#### Section 2

As you read the sentence, you will know whether you agree or disagree.

**A= Strongly Agree, B= Sort of Agree, C = No Opinion/I don't know,**

**D= Sort of Disagree, E = Strongly Disagree**

Circle the letter, that you feel best describes you opinion. Mark every statement.

Work quickly but carefully.

I like math.	A	B	C	D	E
I'd be proud to be the outstanding math student.	A	B	C	D	E
I am happy to get good grades in math.	A	B	C	D	E
It would be great to win a prize in math.	A	B	C	D	E
Being first in a math competition would make me happy.	A	B	C	D	E
Being thought of as smart in math would be a great thing.	A	B	C	D	E
Winning a prize in math would make me feel embarrassed.	A	B	C	D	E
Other kids will think I'm weird if I get good grades in math	A	B	C	D	E
If I get good grades in math, I would try to hide it.	A	B	C	D	E
If I got the highest grade in math, I'd prefer no one knew.	A	B	C	D	E
It would make kids like me less if I were a really good math student.	A	B	C	D	E
I don't like people to think I'm smart in math	A	B	C	D	E
Math does not scare me at all.	A	B	C	D	E
It wouldn't bother me at all to take more math courses.	A	B	C	D	E
I don't usually worry about being able to solve math problems.	A	B	C	D	E
I almost never get nervous during a math test.	A	B	C	D	E
I am usually calm during math tests.	A	B	C	D	E
I am usually calm in math class.	A	B	C	D	E
Math usually makes me feel uncomfortable and nervous.	A	B	C	D	E
Math makes me feel uncomfortable, restless, irritable, and impatient.	A	B	C	D	E
I get a sick feeling when I think of trying to do math problems.	A	B	C	D	E

My mind goes blank and I am unable to think clearly when working math problems.	A	B	C	D	E
A math test would scare me.	A	B	C	D	E
Math makes me feel uneasy, confused, and nervous.	A	B	C	D	E
I'll need math for my career.	A	B	C	D	E
I study math because I know how useful it is.	A	B	C	D	E
Knowing math will help me learn a living.	A	B	C	D	E
Math is an important and useful subject.	A	B	C	D	E
I need to master math for my future work.	A	B	C	D	E
I will use math in many ways as an adult.	A	B	C	D	E
Math is not important in my life.	A	B	C	D	E
Math will not be important in my life's work.	A	B	C	D	E
I see math as a subject that I won't use very much in daily life as an adult.	A	B	C	D	E
Taking math is a waste of time.	A	B	C	D	E
It's not important for me to do well in math as an adult.	A	B	C	D	E
I expect to have little use for math when I get out of school.	A	B	C	D	E
I feel confident trying math.	A	B	C	D	E
I am sure that I could do advanced work in math.	A	B	C	D	E
I am sure that I can learn math.	A	B	C	D	E
I think I could handle more difficult math.	A	B	C	D	E
I can get good grades in math.	A	B	C	D	E
I have a lot of self-confidence when it comes to math.	A	B	C	D	E
I am no good at math.	A	B	C	D	E
I do not think I could do advanced math.	A	B	C	D	E
I am not the type to do well in math	A	B	C	D	E
For some reason, even though I study, math is really hard for me.	A	B	C	D	E
I do fine in most subjects, but when it comes to math I really mess up.	A	B	C	D	E
Math is my worst subject.	A	B	C	D	E
I like math puzzles	A	B	C	D	E
Math is enjoyable to me	A	B	C	D	E
When a math problem comes up that I cannot solve right away, I stick with it until I find the solution.	A	B	C	D	E
Once I start working on a math puzzle, it is hard to stop.	A	B	C	D	E
When I have a question that doesn't get answered in math class, I keep thinking about it.	A	B	C	D	E
I am challenged by math problems I cannot understand right away.	A	B	C	D	E
Figuring out math problems is not something I like to do.	A	B	C	D	E
The challenge of math problems does not appeal to me.	A	B	C	D	E
Math puzzles are boring.	A	B	C	D	E
I do not understand how some people can spend so much time on math and seem to like it.	A	B	C	D	E

I would rather have someone else figure out a tough math problem than have to work it out myself.	A	B	C	D	E
I would rather have someone else figure out a tough math problem than have to work it out myself.	A	B	C	D	E

### Section 3

For the following questions please provide as much detail as possible.

In your opinion, do you think your attitude to math affects your results? Please discuss how.

How do you feel when doing maths? Is it a subject you look forward to or not? Discuss

What reasons do you think some student's don't do well in maths? Discuss

Studies have found that pupils, who have a positive attitude to mathematics, confidence in the subject, who do not worry about their maths ability and can see its use in everyday life tend to do better. Please discuss this statement and if possible make reference to you own experience in mathematics.

Thank you for your cooperation

## Appendix B

### Key to Fennema-Sherman Math Attitudes Scales

A = Attitude toward math (+) = Question reflects positive attitude  
 MA = Mother's math attitude (-) = Question reflects negative attitude  
 FA = Father's math attitude  
 X = Anxiety toward math  
 MT = Motivation toward math  
 U = Usefulness of math  
 TA = Teacher's math attitude  
 C = Confidence in math

Question #	Category	Attitude	Question #	Category	Attitude	Question #	Category	Attitude
1	A	+	25	MA	+	46	FA	-
2	A	+	26	MA	+	47	FA	-
3	A	+	27	MA	+	48	FA	-
4	A	+	28	MA	+	49	X	+
5	A	+	29	MA	+	50	X	+
6	A	+	30	MA	+	51	X	+
7	A	-	31	MA	-	52	X	+
8	A	-	32	MA	-	53	X	+
9	A	-	33	MA	-	54	X	+
10	A	-	34	MA	-	55	X	-
11	A	-	35	MA	-	56	X	-
12	A	-	36	MA	-	57	X	-
			37	FA	+	58	X	-
			38	FA	+	59	X	-
			39	FA	+	60	X	-
			40	FA	+	61	MV	+
			41	FA	+	62	MV	+
			42	FA	+	63	MV	+
			43	FA	-	64	MV	+
			44	FA	-	65	MV	+
			45	FA	-	66	MV	+

Question #	Category	Attitude	Question #	Category	Attitude
67	MV	-	85	TA	+
68	MV	-	86	TA	+
69	MV	-	87	TA	+
70	MV	-	88	TA	+
71	MV	-	89	TA	+
72	MV	-	90	TA	+
73	U	+	91	TA	-
74	U	+	92	TA	-
75	U	+	93	TA	-
76	U	+	94	TA	-
77	U	+	95	TA	-
78	U	+	96	TA	-
79	U	-	97	C	+
80	U	-	98	C	+
81	U	-	99	C	+
82	U	-	100	C	+
83	U	-	101	C	+
84	U	-	102	C	+
			103	C	-
			104	C	-
			105	C	-
			106	C	-
			107	C	-
			108	C	-

**Scoring Directions**

Each *positive* item receives a score based on points.

A= 5 B= 4 C= 3 D= 2 F= 1

The scoring for each *negative* item should be reversed.

A= 1 B= 2 C= 3 D= 4 F= 5

Add the scores for each group to get a total for that attitude

Source: Martin, R. (2002). *Math Attitudes of Gifted Students: A Focus on Gifted Girls in the Elementary Grades*. PHD. Virginia Polytechnic Institute and State University.

## Appendix C



### Parent/Guardian and Participant Information Sheet

**Title of Project:** *The Role of Affective Factors on Mathematical Performance in Irish Post-Primary Pupils.*

**The Study:** My name is Paula Mc Bride and I am currently undertaking a Master's dissertation in Learning and Teaching, under the supervision of Dr. Joseph English. I am examining whether pupils' attitudes, beliefs, motivation and emotions impact on their performance in mathematics. In order to investigate this, I am asking your child to complete a short questionnaire and return it to me.

**Participation Information:** If your child agrees to partake in this study they will be required to:

- Complete a questionnaire.

There are no risks involved in this study. All information gathered will remain confidential and used only for the purpose of this study. It will be stored safely with access only available to the investigator. All questionnaires will be stored in a locked cabinet. All electronic documents will be stored on a password-protected computer. Participants will be identifiable only for the purpose of comparing their results in mathematics to their questionnaire scores. Scores obtained in the questionnaire will in no way impact on your child's future mathematic results. However, no child will be identified in the write up of the research, or to anyone else.

Your child is under no obligation to participate in this study. Should you have any questions or do not understand something just contact me and I will clarify any issues that you are concerned about.

**Contact Details:** School Contact Number: 074 9385988  
Email: paulamcbride@donegalvec.ie

**If you have concerns about this study or would like additional information, you may contact my supervisor.**

*Dr. Joseph English,  
LYIT  
Email: Joe.English@lyit.ie*

## Appendix D



### Parents' Consent Form

**Title of Project:** *The Influence of Affective Factors on Mathematical Performance in Irish Post-Primary Pupils*

Your child is under **no** obligation to participate in this study. If your child agrees to participate, but at a later stage feels the need to withdraw, they are free to do so. It will not affect them in any way.

Please answer all of the following (tick the appropriate box):

	<u>Yes</u>	<u>No</u>
I have read and understood the subject information sheet.	<input type="checkbox"/>	<input type="checkbox"/>
I understand what the project is about, and what the results will be used for.	<input type="checkbox"/>	<input type="checkbox"/>
I am fully aware of all of the procedures involving my child and of any risks and benefits associated with the study.	<input type="checkbox"/>	<input type="checkbox"/>
I know that my child's participation is voluntary and that they can withdraw from the project at any stage without giving any reason.	<input type="checkbox"/>	<input type="checkbox"/>
I am aware that my child's results will be kept confidential.	<input type="checkbox"/>	<input type="checkbox"/>

*I agree to participate in the above study*

\_\_\_\_\_  
*Signature of Parent/Guardian*

\_\_\_\_\_  
*Date*

\_\_\_\_\_  
*Signature of Researcher*

\_\_\_\_\_  
*Date*



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of Technology

### Participants Consent Form

**Title of Project:**

*The Influence of Affective Factors on Mathematical Performance in Irish Post-Primary Pupils*

You are under **no** obligation to participate in this study. If you agree to participate, but at a later stage feels the need to withdraw, they are free to do so. It will not affect you in any way.

Please answer all of the following (tick the appropriate box):

	<u>Yes</u>	<u>No</u>
I have read and understood the subject information sheet.	<input type="checkbox"/>	<input type="checkbox"/>
I understand what the project is about, and what the results will be used for.	<input type="checkbox"/>	<input type="checkbox"/>
I am fully aware of all of the procedures involved and of any risks and benefits associated with the study.	<input type="checkbox"/>	<input type="checkbox"/>
I know that my participation is voluntary and that I can withdraw from the project at any stage without giving any reason.	<input type="checkbox"/>	<input type="checkbox"/>
I am aware that my results will be kept confidential.	<input type="checkbox"/>	<input type="checkbox"/>
I understand that participating in this study will not have any impact on future grades achieved in Mathematics.	<input type="checkbox"/>	<input type="checkbox"/>

*I agree to participate in the above study*

\_\_\_\_\_  
*Signature of Participant*                      *Date*

\_\_\_\_\_  
*Signature of Researcher*                      *Date*

|  
**LYIT**  
**APPLICATION FORM FOR ETHICAL APPROVAL**

**INSTRUCTIONS**

1. No empirical research should be undertaken prior to ethical approval being granted.
2. Copies of proposed questionnaires or a list of questions to be included in any questionnaire should accompany this application form.
3. All fields should be completed. Where Not Applicable applies, please enter N/A.
4. All researchers must complete Section A and, where applicable, Section B and Section C.
5. Section D will be completed by the Institute Research Ethics Committee n (IREC).
6. Appeals of the Decision of the IREC should be completed in Section E
7. Please email completed form to [Researchethics@lyit.ie](mailto:Researchethics@lyit.ie) .
8. **When submitting your form please ensure the Subject Line of your email contains the words “Ethics Application”, followed by your name.** ]



## SECTION A

**Project Title** The Influence of Affective Factors on Mathematical Performance in Irish Post – Primary Pupil's.

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**Date of Submission** 31<sup>st</sup> August 2016

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**Name of all person(s) submitting research proposal**  
Paula Breege Mc Bride

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**Type of Research** Taught Masters  MSc by Research  External Research Funding

**Position** Student  Staff   
*If student, Student No.* L00119839  
*Programme Title*  
*Name of supervisor* Dr. Joesph English

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**Department/Centre** School of Business

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**Email Address** paulamcbride@ymail.com

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**Name of Principal Researcher (if different from above e.g., Student's Supervisor)**

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**Position Held**

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### Pre-existing approval and Multi-agency research

1. If your research has pre-existing ethics approval please attach the approval and submit directly to [researchethics@lyit.ie](mailto:researchethics@lyit.ie).
2. If your research is to be carried out across two or more research centres and ethics approval has already been granted by another agency/institution then please attach the approval and submit to [researchethics@lyit.ie](mailto:researchethics@lyit.ie).

**In both instances there is no requirement to complete the remainder of the application form.**

## SECTION B

1. Describe the purposes of the research proposed.

The purpose of this research is to explore what affective factors influence pupils' performance in mathematics and to examine if they realise that these can affect their performance. This will be done by answering the following research questions:

1. To examine the literature in order to establish key affective factors that influence performance in mathematics. This will be achieved through the literature review.
2. To measure pupils' attitudes, to evaluate if they have a positive or negative view towards mathematics. The Fennema-Sherman Mathematics Attitude Scales (1976), which forms part of the questionnaire, will be used to achieve this objective.
3. To investigate if pupils understand that their attitude, may impact on their success in mathematics. The data provided by the open-ended explorative questions in the questionnaire.

2. Please complete the research ethics checklist below:

	YES	NO
a) Does the research involve human or animal participants?	<input checked="" type="checkbox"/>	<input type="checkbox"/>
b) Does the research involve data of a personal or confidential nature?	<input checked="" type="checkbox"/>	<input type="checkbox"/>
c) Does the study involve participants who are particularly vulnerable or unable to give informed consent e.g. people under 18, people with learning disabilities, older people, students?	<input checked="" type="checkbox"/>	<input type="checkbox"/>
d) Will the study require the co-operation of a gatekeeper for access to participants? (e.g. teacher, local council)	<input checked="" type="checkbox"/>	<input type="checkbox"/>
e) Will it be necessary for participants to take part in the study without their knowledge and consent at the time? (e.g. covert observation of people in non-public places)	<input type="checkbox"/>	<input checked="" type="checkbox"/>
f) Will the study involve discussion of sensitive topics (e.g. sexual activity, drug use)?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
g) Are there issues of safety for the researchers or subjects, aside from those documented in Institute or Departmental Health and Safety procedures?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
h) Could the study induce psychological stress or anxiety or cause harm or negative consequences beyond the risks encountered in normal life?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
i) Will financial inducements (other than reasonable expenses and compensation for time) be offered to participants?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
j) Does the research involve a conflict of interests?	<input type="checkbox"/>	<input checked="" type="checkbox"/>

**If you have answered 'NO' to all of the questions above there is no requirement to complete the remainder of the form. Please submit to [researchethics@lyit.ie](mailto:researchethics@lyit.ie)**

**If you have answered 'yes' to questions (c) please continue and complete the remainder of the application form submit to [researchethics@lyit.ie](mailto:researchethics@lyit.ie)**

## SECTION C

3. Please give a summary of the design and methodology of the project. **Please note** that copies of proposed questionnaires or a list of questions that will be included in any questionnaire should accompany this application form (Compulsory not optional). Please also include in this section details of the proposed sample size, giving indications of the calculations used to determine the required sample size, including any assumptions you may have made. (If in doubt, please obtain statistical advice).

The design of this study is cross-sectional. It will look at a small snapshot of pupils' in the Irish secondary school system and discover if their performance is influenced by affective factors – their beliefs, values, attitudes and emotions/feelings. The methodology used in this study will be a positivistic approach, thus producing quantitative results. The instrument used will be a questionnaire. This will be split into 3 parts. Section A involves classifying information for standard categorical type questions. Section B is a modified version of the The Fennema-Sherman Mathematics Attitude Scale (1976) to ascertain their attitudinal scores. Section C consists of four open-ended explorative questions to gain more detailed information. Please find a copy of the questionnaire attached.

The method used to identify the sampling will be cluster sampling. To represent both Junior and Senior students, participants will be selected from 2<sup>nd</sup> and 5<sup>th</sup> year. These years are chosen as they are both non-exam years so access to them will be more readily available. First years may still have a primary school attitude so these students were deemed unsuitable and Transition Year students have not yet entered the Leaving Certificate mathematics cycle, so they would not be representative of Senior Cycle. In total this gives a population of 209.

Pupils are in base class groups of mixed ability and gender. These groups will be placed in a hat and 3 drawn from each to get the required sample size. 3 class groups from 5 will be drawn from 5 for both years. This will give an approximate of 60 students in the sampling frame for each year group. 60 was chosen as an adequate number as data will be analysed using SPSS software. Pallant, J. (2007). SPSS survival manual (3rd ed.), stated that a minimum of 30 was needed for most statistical analysis using this package. Thus by selecting 60, there will be an adequate number if any questionnaires are not completed or partially completed.

In order for statistical analysis, it must be possible to identify the participants. This is to compare their performance in mathematical tests (Christmas 2015 scores) with their attitudinal scores and to carry out a number of statistical tests. Participants will be given a number, which they will write on the questionnaire. This number will correspond with a legend of names. Both will be kept separate and secure in a locked filing cabinet at all times to protect confidentially. Students' mathematical results from the Christmas Exams in 2015 will be obtained from the school database with permission. The consent forms for the principal, parents and participants makes it clear that participants will be identifiable **only to the researcher**. This will also allow for the withdrawal of questionnaires at a later stage up to the point of data analysis if required.

4. Describe the research procedures as they affect the research subject and any other parties involved.

The following are the procedures that will be followed in the completion of this study:

Step 1 – Defining a problem. Done so in current practice and previous years of teaching, does not affect the participants.

Step 2 – Review of literature. External to participants, so therefore no affect.

Step 3 – Preparing the research design. External to participants, so therefore no affect.

Step 4 – Data Collection. This will require research subject engagement. This will be done after fully explaining the procedure to all participants and guardians and having gained consent. The questionnaire will be administered during a non-exam lesson to reduce disruption. The format of the questionnaire will be explained fully to all participants on the day and they will be given the opportunity to withdraw if required to do so.

Step 5- Data Analysis. All questionnaires are anonymous with only a number to allow for comparison of scores with mathematical test results. Therefore no information given will have any negative affect on participants at this stage.

Step 6 – Interpreting the results and write up. Due to the study being anonymous, no participant will be identifiable. Completed work will also be made available to all participants, if requested.

5. What in your opinion are the ethical considerations involved in this proposal? (You may wish for example to comment on issues to do with consent, confidentiality, risk to subjects, etc.)

There are two main ethical considerations involved with this proposal. These are that the participants are under the age of 18. This means that consent must be sought from the gatekeeper, in this case the school principal. Attached is an information letter attached for the school principal. Written consent has already been received from the school principal. Following that, consent must be got from both parents/guardians and the participants themselves. Find attached and information letter for both to read together and consent forms for both the parents/guardians and the participant to keep in line with BERA (2011) guidelines, that minor should also give consent to participate.

The second consideration is that the participants are pupils in the school in which I teach, so there is a dependable relationship, which will be discussed below.

6. Outline the reasons which lead you to be satisfied that the possible benefits to be gained from the project justify any risks or discomforts involved.

There should be no discomfort caused to any participant. The possible benefits of this project, is that by understanding these factors, I can make adjustments to my current practice in order to enhance pupils' experience and results.

7. Who are the investigators (including assistants) who will conduct the research and what are their qualifications and experience?

The sole investigator is myself. I have a BA in Mathematical Studies and Geography and a PGCE in Secondary Mathematics Education. In addition I have 5 years post-primary teaching experience.

I will have a colleague administer the questionnaire to further increase the reliability and to reduce intrusiveness.

8. Are arrangements for the provision of clinical facilities to handle emergencies necessary? If so, briefly describe the arrangements made.

Not relevant to this study.

9. In cases where subjects will be identified from information held by another party (for example, a doctor or hospital) describe the arrangements you intend to make to gain access to this information including, where appropriate, which Multi Centre Research Ethics Committee or Local Research Ethics Committee will be applied to.

Not relevant to this study.

10. Specify whether subjects will include students or others in a dependent relationship.

This study will include pupils from the school in which I teach. Some I may directly teach and others I may not depending on which classes are selected in the random sample. In order to avoid any bias, it will be explained to students that there are no benefits or repercussions for participation. The questionnaire will be administered in non-mathematical classes in order to reduce the influence of myself as a teacher on the participants. The questionnaire will be group administered and supervised by a colleague to further remove myself from the study.

11. Specify whether the research will include children or people with mental illness, disability or handicap. If so, please explain the necessity of involving these individuals as research subjects.

The research will include children. The necessity of involving minors, is that fact that is the sector in which I teach. In order for this to benefit my practice, it is required to work with the age range in which I teach.

12. Will payment or any other incentive, such as a gift or free services, be made to any research subject? If so, please specify and state the level of payment to be made and/or the source of the funds/gift/free service to be used. Please explain the justification for offering payment or other incentive.

No.

13. Please give details of how consent is to be obtained. A copy of the proposed consent form, along with a separate information sheet, written in simple, non-technical language **MUST** accompany this form.

Consent first will be sought from the school principal. Following that an information sheet and consent form will be given to participants to complete with their parents/guardians. Following the return of these the questionnaire will then be administered.

14. Comment on any cultural, social or gender-based characteristics of the subject which have affected the design of the project or which may affect its conduct.

In the breakdown of the school population, there is an equal gender balance. Purposeful selection of the sample group will maintain this. The population comes from a small area, based roughly in a 30-mile radius of the site. So will be limited to the social and cultural groups in the area. This is a very homogeneous population, from a similar background.

15. Please state who will have access to the data and what measures which will be adopted to maintain the confidentiality of the research subject and to comply with data protection requirements e.g. will the data be anonymised?

The research will have access to this data. Questionnaires will be numbered by an allocated number given to the selected participants. A legend of these names will be kept secure and away from the questionnaires at all times to protect confidentiality. It is important that completed questionnaires are identifiable in case a participant may wish to withdraw. This is also need to enable statistical analysis with results and attitudes.

This data will be stored in a locked box. Electronic records and results generated will be stored on my private password protect computer. Files will be further password protected. All data will be destroyed in the timeframe and manner set out by LYIT policy. The legend key will be stored separately to the questionnaires. The questionnaire will only have a number so if found the will be unidentifiable. All data will be destroyed in according to guidelines.

16. Will the intended group of research subjects, to your knowledge, be involved in other research? If so, please justify.

No, not to my knowledge.

17. Date on which the project will begin and end.

Data collection will begin the week starting the 29/Feb/2016  
Submission of thesis 31<sup>st</sup> August 2016

18. Please state location(s) where the project will be carried out.

Research site is Moville Community College, Moville, Co. Donegal

19. Please state briefly any precautions being taken to protect the health and safety of researchers and others associated with the project (as distinct from the research subjects) e.g. where blood samples are being taken

No known security concerns for participants or the researcher. I will be familiar with the school's policy for disclosures in advance of commencing the research and I will follow the protocol if any disclosure is made while I am conducting my research.

20. Please specify how any data obtained during the course of the research will be stored and how long the data will be retained for.

All data will be collected, processed, and stored in compliance with relevant data protection legislation and in compliance with LYIT's Guidelines for Electronic Data Storage.

## DECLARATION

### Researcher

I confirm I will carry out the research as indicated in the above form



### Research Supervisor

I confirm that this form gives an accurate account of the proposed research



## SECTION D

*For office use only*

### INSTITUTE RESEARCH ETHICS COMMITTEE

**DATE:**

**DECISION**

1. Approved without amendment
2. Approved subject to minor modifications   
*(No resubmission required, supervisor responsible for ensuring that modifications are implemented)*
3. Modifications required. Complete modifications below and resubmit.
4. Additional information required.
5. Approval withheld. All conditions set by Institute Research Ethics Committee must be met.
6. Reject.

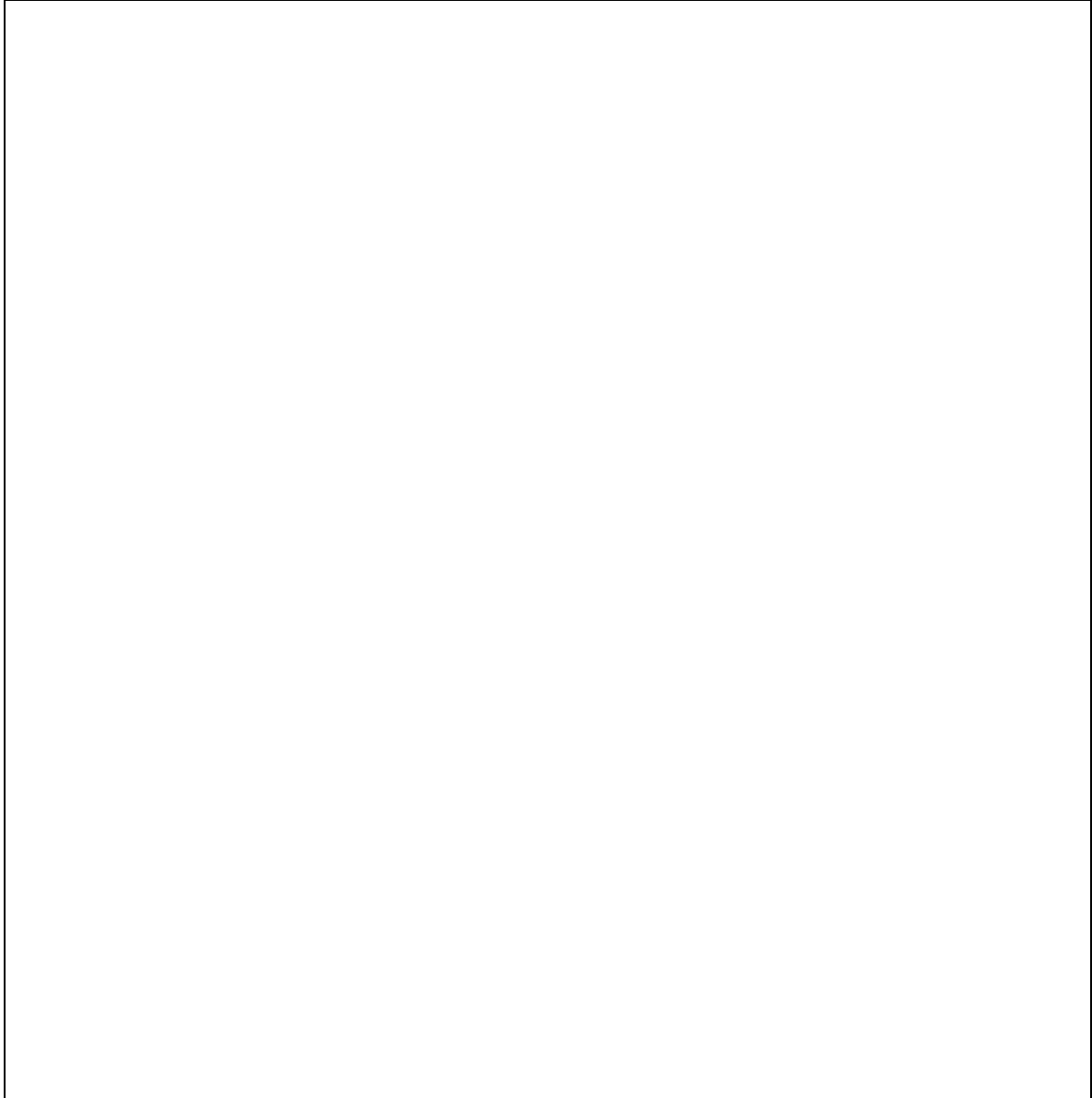
**REASONS FOR DECISION**



## **SECTION E**

### **APPEAL**

Please outline in detail the reasons why you are appealing the decision of the Institute Research Ethics Committee.

A large, empty rectangular box with a thin black border, intended for the user to write their appeal. The box occupies most of the page's width and height below the instructions.