The Continuum of Teaching and Learning of Mathematics from Primary to Post-Primary Level: Experiences and Beliefs of Associated Teachers

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Abstract

The transition from primary to post-primary is arguably the most challenging period in one's educational trajectory path. Yet, very little research evaluates the impact of the transition process on 'subject-specific' performance. In 2015, TIMSS found that Irish primary students out performed their second level counterparts in mathematical achievement. Recently, higher failure rates at Leaving Certificate level have also been reported. Summative assessment is a protruding difference between both levels as there is generally less testing at primary level. Therefore, these factors catalysed the need for research, where curricula delivery at both schooling levels were examined, to see if any affective aspects on the transition also prevail in County Donegal, Ireland. Teachers' perceptions and current transitional programmes were also investigated. A mixed method sample was employed, including both lesson observations and a questionnaire, which provided a triangulation of data collection, where commonalities improved the credibility of findings. Despite the small nature of the study, many findings correlated with the assertions of existing transitional research. Teaching methodologies had many similar characteristics, yet assessment emphasis and resource use were stark differences between both levels. Teachers' knowledge about the transition varied and there appeared to be a lack of consistency in transitional programmes used. Future recommendations, derived from research findings, included the need for more collaboration among teachers from alternate levels. In addition, policy makers and principals need to recognise the link between transitional practices and mathematical performance, as existing procedures may require some adaptation, to help create smoother mathematical transition processes.

Key words: Educational Transition, Mathematics, Primary, Post-Primary, Ireland

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SECTION ONE – RATIONALE AND INTRODUCTION

1.1 Introduction

Evangelou *et al.* (2008) describe a change of schooling levels as the move of students out of one school system and into another, or within the same school, but between different years. The two words "Transition" and "Transfer" can be used interchangeably to describe this process. In this research, as in their study, "Transition" will be used to address children's move and adjustment phase from primary to post-primary schools.

The transition from primary to post-primary has been depicted as one of the most difficult changes in a pupil's educational career (Zeedyk *et al.* 2003). The move from the smaller, more personal environment of primary school to the larger impersonal world of the secondary school typically requires significant adjustment (West *et al*. 2010). There is stark evidence that has proven that the trajectory pattern of learners' motivation declines as they pass through compulsory educational levels (Graham *et al*. 2016). However, it is argued that a "smooth transition" between educational contexts is of paramount importance as unsuccessful change can result in difficulties with student attainment, particularly if challenges arise in the newer, most recent schooling level (Evangelou *et al*. 2008). Environmental issues, such as larger buildings and older peers, to name a few, will more than likely cause difficulties, regardless of the context or geographical setting. Yet, a continuum of learning approaches among teachers and relationship between curricula at both levels are factors that can be controlled to aid more successful transitions. This study will focus on the teaching and learning of mathematics at both mainstream primary and secondary schools in County Donegal, where common threads and/or differences in methodologies employed will be investigated. Experiences and beliefs of teachers in the same region will also be examined.

Primary education in Ireland consists of an eight-year cycle, beginning with two years in junior and senior infants, moving into first class up until the final year which is sixth class (NCCA 2018). Generally, children start primary school at five years and leave at 12 years. Mathematics at primary school level encourages a 'constructivist approach', where students are active participants in the learning process and acquired information is interpreted by the learners themselves. Also, assessment is implemented on both a formative and summative basis (Ireland, DES 2009). Formative assessment or assessment of learning (AfL) is a process of collecting evidence within the stream of instructions that should inform teaching and learning

(Black *et al*. 2004), whereas summative assessment or assessment of learning (AoL) occurs when facilitators use evidence of student learning to make judgements on achievements in comparison to goals and standards (Victoria State Government, Education and Training 2016). AoL occurs through the medium of Standardised Scores or 'Standard Ten' (STen) testing. Standard Scores are transformations of raw test scores, typically having a range from 55 to 145, with an average at approximately 100. STen tests provides a score of ability, out of ten in English reading, Irish reading and mathematical abilities. Either STen tests or Standardised Scores must be implemented in the latter stage of the academic year of second, fourth and sixth classes only (NCCA 2012). It is therefore evident that AfL approaches are utilised more frequently at primary school level.

The post-primary or second level in Ireland caters for students usually within the age range of 12 to 18 years of age (Citizens Information 2018). Students must engage with at least five academic years of studying mathematics. The syllabi at both Junior and Leaving Certificates do not explicitly refer wholly to a 'constructive approach' but it has very similar principles. It aims to place great emphasis on effective problem-solving strategies as it is integral to mathematical learning. Problem solving means engaging in a task for which solutions are not overly obvious (NCCA 2016). Unlike primary school structures, summative assessment is more prevalent, as students frequently sit 'end of chapter exams', termly exams and subsequently the state examinations as part of the Junior and Leaving Certificate courses. Indeed, AfL also exists in the post-primary classroom, however the more dominant role of AoL at second level must dominate teaching and learning processes. Assessment practices are important for measuring the depth of teaching and learning. Despite being often criticised, assessment should be considered a crucial driving force behind teaching methodologies, and teachers would find it very difficult to manage without it (Petty 2009). Therefore, teaching and learning at both levels must differ somewhat due to the deviation in formative and summative assessment practices. The corollary to this must also mean that student experience must differ at both levels. This variation in teaching and learning practices may then affect student attainment after transition. Midgley *et al*. (1989) outline that there is sometimes a sharp decline in progress in mathematics soon after a change in school levels. This can be detrimental to progression at post-primary level as academic self-efficacy can be strong predictors of related academic performance.

1.2 Rationale

As a post-primary teacher of mathematics, it is often observed that first-year students generally present as eager in their initial stages at second level school. Creative methodologies are used with enthusiasm when attempting problems in class. However, this confidence and eagerness frequently diminishes by the end of the first term and sometimes it is difficult to reverse. Confidence is imperative for success or failure when completing tasks (Pajares 1996). Society has always recognised the long historical association between mathematics and anxiety, and how they regularly exist simultaneously among students, as mathematics can be perceived by students as difficult and sometimes even threatening (Tootoonchi 2017).

Irish students scored relatively higher than average in the Trends in International Mathematics and Science Study (TIMSS) in 2015. Part of this research examined the mathematical abilities of fourth-class primary school students and second-year post-primary students respectively. Students were assessed based on the relevant cognitive demands according to age. The primary students obtained a mean score of 547 when the post-primary students achieved a mean score of 523 (Clerkin *et al*. 2016). Arguably, this is not a significant difference, yet post-primary students did however score lower than their primary counterparts.

In recent years, there have been notorious failure rates in mathematics at State Examinations level. In 2016, approximately 7.3 per cent of students who completed either the higher and ordinary level papers, failed the subject at Leaving Certificate level (O'Brien 2016). Apprehension, anxiety and ability are most commonly referred to in literature regarding mathematical achievement (Tootoonchi 2017; Tezer and Bozkurt 2015; Kazelskis 1998). Yet, the impact of effective continuation practices in teaching and learning approaches, from primary to post-primary, is rarely alluded to, nor is it considered when discussing regression in mathematical achievement, despite its relevance to accomplishment.

Existing research outline generalised findings or discuss how transitional phases refer to the negative impact of the move on mainstream students, students from ethnic minority groups or students with Special Educational Needs (S.E.N) (Smyth *et al*. 2004; Zeedyk *et al.* 2003; Graham and Hill 2003). There has been very little research about 'subject-specific' transition processes from one educational setting to another, particularly within the Irish context. Assertions found in this study may provide a gap in such knowledge and/or a different perspective about the effects of transition at a local context, but it may also complement existing educational research and policies. Policy documents are very much intertwined in the systematic procedures of schools. Furthermore, education reform is typically motivated by criticisms and recommendations of existing practices (Levin 1998). Therefore, it is envisaged that perhaps any new findings in this area may contribute to both theory and practice by providing guidance to other policymakers, such as the Department of Education and Skills

(DES) or the National Council for Curriculum and Assessment (NCCA), school principals and teachers alike.

1.3 Summary and Chapter Outline

Despite its possible contributions to education and mathematics, the study was expected to be localised and small scale. It was hoped that at least 50 questionnaires would be completed, hence low variability may occur in the data findings. For example, 20 responses may generate comparative data, yet testing for statistical significance would be inappropriate due to the small number of participants (Sapsford and Jupp 2006). Additionally, lesson observations took place in a primary and post-primary school, both of which are situated almost adjacent to one another. It would have been extremely beneficial to observe other classrooms further afield to gain insight into other contexts and cultures of the teaching and learning of mathematics nationally.

Lastly, as a post-primary teacher, the researcher must be cautious not to skew logic because of fundamental values, particularly when interest of the phenomena of educational transition emerged from the interplay of direct experience. It is also important to note that one of the research sites is the employment place of the researcher. A radical inquiry process was employed to ensure 'false consciousness' or bias was unveiled, and an empowered consciousness was created by reducing illusions (Marshall and Rossman 1999). Therefore, appropriate measures were implemented to prevent bias and improve reliability and validity of the research findings.

This section introduced the main elements of the research, including the phenomenon being investigated, the aims of the study, the rationale and the associated justifications. Possible contributions and limitations were also identified.

In the next three sections, the research aims will be revisited and extended in greater detail. Section Two contains a Literature Review and Critique of the research topic. The continuum of teaching and learning of mathematics across both levels will be contextualised. Linkages between aspects found in policy documents, curricula and national/international current research findings are weaved together and critically evaluated. Section Three outlines a discussion and justification of the chosen methodologies, data findings and analysis. Ethical considerations and procedures are also included and explained. Finally, Section Four includes the derived conclusions from the main findings, the current situation of mathematical transition and recommendations for further study.

SECTION TWO – THE LITERATURE REVIEW

2.1 Introduction

This section examines the relevant literature and research findings about the transition process. As there is very little mathematical transition research, generalised transition findings are discussed and linked to the current Irish mathematical practices instead. The chapter is then summarised, and limitations are highlighted.

2.2 Transitionary Phase from Primary to Post-Primary: Existing Research

European educational authorities have only started to pay attention to the pupils' needs during the transition from primary to post-primary school in the past twenty years. Relatively few accounts of transition research have been published in academic literature and those that have been, tend to originate from the United States (US) and United Kingdom (UK) (Zeedyk *et al*. 2003). There has been research published on the effects of the transition, however, reports carried out within Irish contexts quite often refer to the impacts of the move of vulnerable students or 'high risk' individuals, such as children from minority ethnic backgrounds or students with special educational needs. One study conducted by Smyth *et al*. (2004) however, investigated the gaps in Irish research regarding the transition and how post-primary schools can influence the integration of learning throughout first year. Yet, there are few national studies that address the effects of transition on specific subject attainment, such as mathematics.

The move from primary to post-primary can provoke high levels of stress and it is commonly accompanied by a regression in student attainment (Galton *et al.* 1999). Additionally, despite the existence of many positive experiences, some students may encounter challenges, particularly in social scenarios. As a result, educational institutions and schools have recognised the need to introduce a range of measures, especially to help improve communication among children, teachers and parents (Graham and Hill 2003). Such measures include, primary school children visiting potential secondary schools to familiarise themselves with the environment and teachers. Other strategies include providing information leaflets, matching older and younger pupils as buddies for the year ahead or having past pupils return to their primary school to talk about their post-primary experience (Zeedyk *et al*. 2003). The research above, however, seems to emphasise and measure aspects of the 'hidden curriculum', that is, the important implications of how students learn to socialise (Rosenbaum 1976).

Schools need to modify some of their current attempts of achieving a better equilibrium between social and academic concerns during transition (Galton *et al*. 1999). There appears to be a lack of strategies in place, to perhaps assist the implementation of 'formal curricula'. It has been found that primary schooling did not prepare students adequately for subjects at postprimary level (Smyth *et al*. 2004). Furthermore, first year students often present from primary school without the adequate mathematical skills necessary to engage with Junior Cycle mathematics (Shiel and Kelleher 2017).

2.3 Curriculum Continuity and Teaching Methodologies

Curriculum continuity is a dominant issue in existing research as it can be an influential aspect in the provision of successful transition (Smyth *et al.* 2004; Evangelou *et al*. 2008). Generally, it has at least three principles that can be analysed during the transition period; written curricula, operational curricula and the associated learning experience (Nicolescu and Petrescu 2015). The execution of such three aspects, for the most part, rely on the schooling authority and learning facilitators. Teachers must take a certain level of responsibility for the failure to activate continuity, at both levels. Not all schools are actively paying attention to the possible differences between teaching methodologies in the different phases and furthermore, secondary teachers still 'cling' onto the ideology that secondary school entails a 'fresh start'. Therefore, it is assumed that the importance of continuity is almost disregarded (Galton *et al.* 1999). Differences in teaching often include a shift from an emphasis on student involvement in discussion at primary level to one where students are expected to listen to adult dominated, teacher-pupil exchanges at post-primary level (Smyth *et al*. 2004). Graham and Hill (2003) suggest that further dialogue about varied practices at both levels is required among teachers from alternate schools. There is a tendency by teachers from all phases to hold certain stereotypical views about how other schools are run. Post-primary teachers often underestimate the demands primary teachers make of pupils. A multitude of transition programmes are being implemented, including induction days and informative procedures, yet improved communications between schools is required, perhaps setting up joint primary-secondary school projects (Galton *et al*. 1999). This would provide an opportunity for primary and secondary teachers alike to network and collaborate. To successfully perform their job, teachers should be proficient collaborators, as teamwork is a phenomenon of growing importance in society (Vangrieken *et al*. 2015). This should not be exclusive within a particular school, but it should be completed across all schools due to the relevant connections between teaching and learning at both levels. In reality, the social aspects of students' experiences such as ethnicity, social class and bullying, can only be assisted to a certain degree at school, regardless of level.

Differentiation, inter-culturalism and policy adaptation can help make schools more assessible for students, regardless of their background. Nonetheless, there are many events that are outside the remit of a school's control in relation to such aspects of the 'hidden curriculum'. However, the facilitation of the formal curriculum, is indeed, easier controlled, therefore, a more proactive approach to curriculum continuity should be in effect to help ease the transition process.

Most literature refers to the time frame of the educational transition, i.e. the move from sixthclass in primary school to first-year in secondary school. Often the focus on the years that follow the transition is lost. Schools focus on the entrance years, yet much of the dramatic changes for an adolescent can occur in second year (O' Brien 2006). There are currently no state examinations in second-year and fourth-year at post-primary level. This perhaps allows for more social distractions from academic tasks. Therefore, policy makers should also give greater priority to the 'in house' transitions, between academic years at the same level, to sustain their commitment to learning at difficult moments in their careers (Galton *et al*. 1999) This too may help identify 'gaps' in learning that is currently being overlooked during significant times in educational transitions (Ireland, DES 2012).

2.4 Mathematics and Transition Phases

Recently mathematical teaching and student performance in Ireland have been positively evaluated. Students in Ireland attained a mean score of 503.7 in the overall mathematical study of the Performance for International Student Assessment (PISA) in 2015, which was slightly above the average result (Shiel and Kelleher 2017). Similarly, in the same year, Irish students who took part in the Trends in International Mathematics and Science Study (TIMSS) scored a mean score of 547 in mathematics which was significantly above the TIMSS centre point (Clerkin *et al.* 2016). Nevertheless, findings outline in Section One and other recent assertions are not as positive. Recently primary students outperformed post-primary students, there were increased failure rates at Leaving Certificate level and teachers reported that primary students are lacking preparedness and numeracy skills when joining secondary school (Clerkin *et al.* 2016; O' Brien 2016; Shiel and Kelleher 2017). It is possible that the transition phase contributes to this stark mismatch in research findings.

In the UK, Mathematics, Science and English are of national concern due to the fact pupils acquire a negative image of these subjects after transition. Galton *et al.* (1999) found that curriculum overlap can be especially problematic. Some pupils may lose ground in academic performance, as students feel like they are revisiting work that they have already completed, which causes boredom, particularly if they had high expectations of the move to secondary school. In first year, Irish students participate in the “Common Introductory Course” (CIC) in mathematics. This was designed to facilitate a smooth transition between primary school mathematics and the Junior Certificate mathematics by assuring that prior knowledge is recalled. It is often argued that effective reactivation of prior knowledge can enhance memory processes considerably and thus foster knowledge acquisition, as the encoding, consolidation and retrieval of events can scaffold the learning of new skills and relevant information (Shing and Brod 2016). The CIC must be studied by all learners as a minimum to ensure that topics from fifth and sixth classes are revisited (NCCA 2016), thus proving a recall of information but also showing the reiteration of course content. It cannot be argued that there is not a direct relationship between both curricula at primary and post-primary level as it is evident that a certain element of curriculum continuity is in effect, in theory. Perhaps teaching methodologies may need to be adapted when implementing curricula objectives, so that all abilities are catered for in the classroom, thus ensuring that the overlap of course content has a meaningful purpose for all.

Previously, teaching methodologies at both primary and post-primary level have been criticised as being old-fashioned and not student-centred. Treacy (2016) argues that there is a continual process of traditional methods being used when teaching mathematics at primary level, which does not sufficiently prepare pupils for the demands of contemporary society, nor does it align correctly with the curriculum objectives. Additionally, a report published by the National Foundation for Education (NFER) in 2013 outlined that teaching approaches of mathematics at post-primary level were described as “traditional” and content was emphasised, as opposed to highlighting the processes that should be promoted within it (Jeffes *et al*. 2013). Due to the similar nature of the criticisms at both levels, it is possible to assume that continuity across curricula may be occurring, but perhaps it may not be effective continuity. Curriculum continuity during educational transitions is essential, yet, it is also essential to recognise ‘curriculum discontinuity’ (Galton *et al*. 1999). The revision of traditional teaching methodologies at both levels is necessary and perhaps more Student-Centred Learning (SCL) should prevail instead. Teachers need guidance at the same time. Neither curricula at primary nor secondary suggest methods to ease the transition process, doubtlessly the process is referred to, however very little guidance is provided for schools and teachers alike. Smyth *et al*. (2004) identified the need for common pre-service training to inform primary and post-primary teachers about the transition process. This would be particularly useful if training was provided to effectively guide curricula principles collaboratively.

2.5 Change in Assessment Practices

Complexities in curriculum continuity are imminent considering the significant differences in assessment practices at both levels. At primary level, pupils are continually assessed formally in classroom activities. Generally, students are only assessed on a summative basis through standardised testing, however, this is not specifically assessing progress in mathematics as a subject, instead, although relevant, such examinations focus on literacy and numeracy levels. Second level students can engage with five academic years (six if Transition Year is completed) of studying mathematics. Summative assessment processes occur more regularly. Students sit 'end of chapter' exams, term exams and subsequently the State Examinations, as part of the Junior and Leaving Certificate courses. Interestingly, the Primary and Junior Certificate mathematics syllabi have very similar aims, despite the differences in assessment practices. In their study about the transition process in 2004, Smyth *et al.* found that major differences between teaching methodologies, due to assessment practice, were an obstacle to successful transition. This included a distance from a culture of care in primary school to the academic and exam-orientated culture in post-primary education. Unfortunately, however, many teachers feel they must teach according to exam requirements. Results from students' assessments point to teachers' conceptions, which therefore influence classroom decisions. This undoubtedly has adverse effects on the teaching and learning around assessment practices (Remesal 2011). Teachers can be guilty of using actual test material that mirror examinations instead of directly instructing students towards the body of knowledge or skills that a test represents (Popham 2001). If such a dramatic change of teaching approach occurs at second level, then student experiences will indeed be different. Frequently, such systematic changes in classroom environments between both primary and post-primary settings contribute to a decline in performance (Midgely *et al*. 1989).

In addition, assessment practices at Junior Certificate commonly dictates a streaming practice, where students are banded in class groups based on ability. Conversely, most classes at primary level are of mixed ability, which can often lead to greater lesson participation as students tend to be more co-operative in non-streamed environments (Hallam and Parsons 2013). Also, Francis *et al*. (2016) describes the practice of streaming as "within school segregation", which can lead to attainment gaps by highlighting inequalities in ability.

Historically, mathematics has been recognised as a subject where student progress typically regresses soon after the transition phase (Evangelou *et al.* 2008). Since the introduction of the Project Mathematics course, teachers now feel that there simply is not enough class contact time to cover all the topics in the syllabus (Murray 2013; Shiel and Kelleher 2017). This pressure may minimize free time for the implementation of transition scaffolding procedures, especially if time only permits for curriculum delivery. Unlike education systems at Higher Institutions, schools and teachers do not have the flexibility to modify nor adapt courses with respect to the needs of students within their context during the transition period. Curriculum and guidelines set out by the DES and NCCA must be adhered to rigidly.

2.6 Chapter Summary

This chapter examined current literature available regarding transition. Generalised findings from previous studies were compared. Curriculum principles and information regarding the transfer process and mathematics were also outlined. It is, however, important to further acknowledge other aspects of the previous literature.

Much of the research findings about transition phases discussed previously in this section were from studies carried out in the UK. Information was utilised and transferred to relevant literature in Ireland. Galton *et al*.'s study in 1999 about the transition phase could be considered statistically significant, as 215 schools took part in the study. Cohen *et al*. (2007) state that surveys can be categorized as 'reliable' if thirty cases or more are examined. Nonetheless, it cannot be ignored that there are considerable differences between schooling in Ireland and the UK. Firstly, primary school students in the UK typically begin the transition phase a year earlier than Irish pupils. Another stark difference is that teachers in the UK are less reliant on text books for lesson dictation, when they are an integral resource used for lesson design in Ireland (Uteach 2015). Both accountable differences would indeed affect the transition phases in both countries, therefore it may not be feasible to transfer findings from such studies without being conscious of the comparisons.

Generally, inspectorate reports are compiled based on a summary of findings of a collection of inspections that occurred over a particular time frame. Like any statistical inferences, findings become generalisations based on information about samples of the total population, if reliability and validity prevail (Saunders *et al*. 2009). However, like many other educational reports, inspectorate summaries fail to recognise the importance of school context. Edwards and Barker (2014) highlights the pertinence of context when implementing research and how recommendations can be used to characterise contexts, yet a description of how strategies can be applied to certain contexts must also be included. Although very useful, there is a failure to resonate with such principles in many educational reports. It is essential to acknowledge that 'one size does not fit all' for any educational setting and context is hugely important.

The primary mathematics curriculum could be considered obsolete as it was published in 1999. In the past 20 years, there have been significant changes in Ireland involving technological developments and even currency. Outdated curricula can fail to interest students and pose a threat to vulnerabilities and inefficiencies in practice (Curtis 2003; Hummer *et al*. 2015). Nevertheless, curriculum reform is in effect. The DES plan to release a new curriculum that will be implemented in primary schools from junior infants through to sixth-class in 2021 (NCCA 2018).

Furthermore, the current Junior Cycle is under reform. This began in September 2014 on a phased basis, where different subjects were introduced in stages. The implementation of new specification for mathematics is due to start in September 2018 (NCCA 2015). One stark difference with the new practice is that the use of formative strategies will be acknowledged. Ten percent of a student's final grade will be obtained from Classroom Based Assessments (CBAs) with the remainder being awarded to a terminal exam. There will be more flexibility in module design also, with the introduction of short courses (NCCA 2015). Although one could argue that essentially the certificate is still awarded on a summative basis, still it is a step in the right direction of improving current assessment practices at post-primary level.

Both adaptations to the Irish education system may impact on future transition if the need for a continuum of teaching and learning across both levels is addressed, either in policy or curricula or both. This study, however, will focus on the current educational practices.

In the following chapter, the research methodologies are outlined and justified. Results are analysed, referring to the literature outlined in this section, where relevant and new assertions are also critiqued.

SECTION THREE - IMPLEMENTATION AND EVALUATION

3.1 Introduction

In the main, this section explores the research methodology that was utilized in this study. First, the research aims of the study are stated. Context and research settings are also identified, followed by the philosophical affective influences that accelerated the listed research aims. The chosen methodologies are examined, and their selection is justified, which leads to the consecutive data analysis of such methodologies. A discussion is then fabricated using the research aims, appropriate research assertions and relevant literature.

3.2 Research Aims

The focus of this research proposal is to;

a. Evaluate the delivery of curricula content across a local primary and secondary school setting, comparing teaching methodologies, noting any new assertions in teaching approaches when facilitating the learning of mathematics.
b. Investigate teachers' perceptions and knowledge of the transitionary phase.
c. Determine if any practices are in place to help with the change from senior level primary mathematics to Junior Certificate mathematics at post-primary level.

3.3 Research Site

In Section Two, the Literature Review discussed other studies about the transition period from primary to post-primary school. This study aims to obtain information about the context of this transition process in County Donegal.

Research was conducted using both observations and questionnaires. Mathematical lesson observations were performed in a primary and a post-primary school, both located in XXXX, County Donegal.

XXXX primary, is a co-educational Catholic primary school that is under the patronage of Bishop Alan McGuckian (Roarty 2017). Being the only primary school in XXXX town, it has a current enrolment of 168 students. It is one of 178 primary schools in County Donegal (School Days 2017). Mathematics lessons in the senior classes (fifth and sixth) of this school were observed.

XXXX post primary is a co-educational, non-denominational post-primary school. It serves quite an extensive catchment area, comprising of primarily rural communities, with a maximum radial distance of approximately 20 minutes from the school. The student population for the academic year 2017/18 saw a student population of approximately 800 pupils enrol. Historically, the school was established as a convent for girls only in 1966 but in the following year, it became the first co-educational convent school in the country (Loreto Community School 2017). Mathematics lessons at first and second year were observed in the post-primary setting. The selection process of lesson observations was based upon the age groups that were closest to the age range of the students who generally engage with the transition process (typically 12-14 years of age).

3.4 Philosophy

Saunders *et al*. (2009) devised a visual representation that guides a multitude of research approaches called the 'Research Onion' (Figure 3.1). It was designed initially for business students, but it is applicable to other fields, such as educational research. This framework is useful for deciding upon research practices, therefore, this study adopted methodologies using the 'Research Onion'. The process begins in the outer layer and moves inwards to reach the next step. The discussion of such relevant steps, according to the layers, will be outlined in the order depicted too. Generally, research originates from sets of beliefs, commitments and hopes, which are subsequently demonstrated in practice. Questions therefore arise about how one views themselves (ontology), how we come to know (epistemology), how we do things (methodology) and what we hope to achieve (McNiff 2013). In addition, a methodology should encompass the philosophical assumptions and this section of the 'Research Onion' lies on the outside. Most commonly either a 'Positivist' or an 'Interpretivist' paradigm can be applied to social research. Positivism consists of highly structured research with objectivity to values. In addition, large samples are used and quite often hypothesis testing occurs (Raddon 2010).

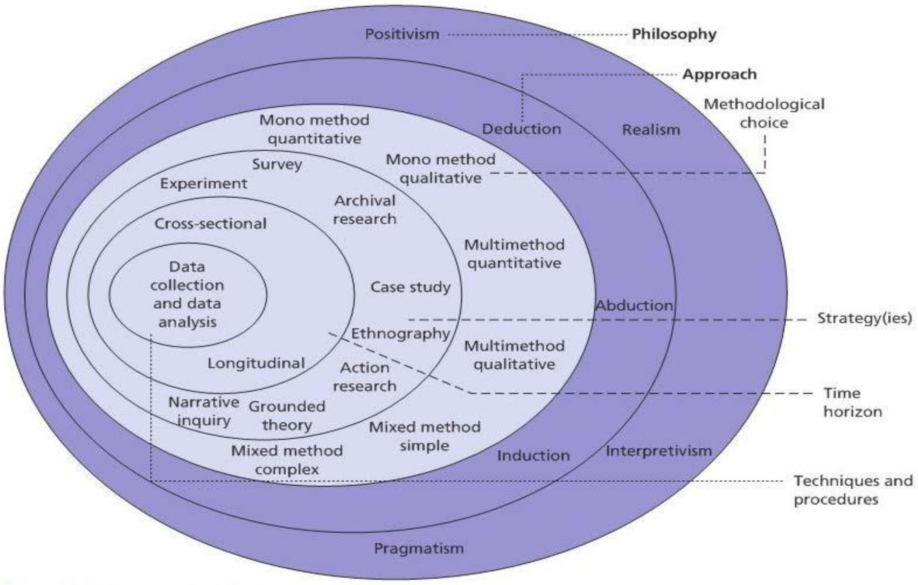

Figure 3.1 The 'Research Onion' (Saunders *et al*. 2012)

Conversely, Walsham (1995) describes Interpretivism as an approach that adopts a position in which knowledge of reality is socially constructed by participants, often referred to as being 'human actors'. Generally, value-free data cannot be obtained since the enquirer uses preconceptions to guide the enquiry. Samples sizes are also typically small.

The aspirations of this research aligned with the principles of Interpretivism more so than the criteria associated with Positivism. Some research aims are more open-ended, and in truth, a hypothesis is not being tested. Instead, the research adapted an empathetic stance to the research participants to resonate with reality from their point of view (Saunders *et al*. 2009). This anti-positivist approach involved studying human actors. It was envisaged that during the lesson observations, teachers and their teaching styles would be observed, and their delivery would be evaluated, with an open and empathetic mind. With an Interpretivist approach, the researcher was looking for new information rather than focusing on a limited number of possible outcomes. Therefore 'Inductive Reasoning' occurred, where data obtained was used to develop theory (Bryman 2012). Interpretivism does not come without criticisms however. Cohen *et al*. (2007) argue that actors, in this case, teachers, who are being observed, may be conscious of the enquirer's presence. The researchers are then finding an objective perspective which is not necessarily that of any of the participating actors at all, particularly if they are behaving differently. Furthermore, there are higher risks of subjectivity in findings, that may not be completely accurate, perhaps even biased. This was to be sincerely considered as the researcher was a post-primary teacher of mathematics also. Impartiality should reside permanently throughout, and intrinsic values should be less prioritised when analysing any data found in the research process.

It could be argued that a Positivist paradigm could also be applicable to this study. One research aim addresses the possible existence of curriculum continuity across primary and post-primary levels, which could be considered a hypothesis as it could be proved true or not. Nevertheless, Positivism is less suited to this research due to the relatively small sample size and the localised context of the research sites. In addition, human behaviour in this approach is often passive, determined and controlled (Saunders *et al*. 2009). Therefore, Positivism could not be applied in a study of this nature which involved a significant amount of behavioural response and opinions.

3.5 Chosen Methodologies

3.5.1 Mixed Method Sample

Qualitative methods involve studying people in their natural social setting, learning how they understand their situations and accounting for their behaviour (Richards 2014). Interpretivism is frequently associated with qualitative research, as it can include an inductive approach (Saunders *et al*. 2012 cited in Boland 2012). It was envisaged that only qualitative methodologies would be utilised as they are generally viewed as being efficient in establishing important variables in educational research. Yet Siraj-Blatchford *et al*. (2006) argue that the marriage of qualitative and quantitative data can reap many benefits as it results in an accumulation of evidence, particularly if the sample size is small. This may subsequently lead to new findings, thus providing a clearer picture overall. Combined approaches have gained massive popularity in social research (Creswell 2009). Smyth *et al*. (2004) adopted this dualmethod approach in their study about experiences of first year students post-transition. They argue that using both techniques allowed for the exploration of a multitude of experiences, while at the same time students accounts were placed within the context of generalisable findings on policy and practice across post-primary schools. Therefore, a similar mixed method sample was established, using qualitative and quantitative approaches. As this study is considered small-scale, a mixed methods approach would suit best to ascertain information about teaching and learning during transition phases in a localised context. A mixed methods approach is also useful when trying to assess cultural factors on psychological constructs, as qualitative approaches can be used to inform quantitative data or vice versa, depending on the research schedule employed (Hitchcock *et al*. 2005).

In this study, qualitative approaches, through the medium of lesson observations, investigated the cultural factors of teaching and learning practices in two educational settings in XXXX, County Donegal. Soon after, the quantitative approach was achieved by distributing questionnaires to primary and post-primary schools throughout County Donegal, which further investigated teachers' experiences and opinions about the transition process. It was envisaged that data found from the questionnaires would complement the initial findings of the lesson observations, thus providing a more fruitful research engagement (Siraj-Blatchford *et al*. 2006). However, challenges can arise from choosing a dual-method approach. Often inquirers need to perform intensive data collection, including text and numerical data analysis as opposed to evaluating perhaps only one style. This can be extremely time consuming. In addition, the researcher must adhere to an appropriate time schedule, either triangulation, sequential or simultaneous implementation. Effective schedules are imperative for research efficiency (Creswell 2009). Another limitation related to the integration of quantitative and qualitative research can occur in data evaluation. Sometimes insufficient attention is paid to the 'wiring up' of mixed methods findings and to how they can be integrated (Bryman 2007). Therefore, careful consideration and care was taken when analysing and evaluating data. An appropriate framework for the methodologies were also followed (Saunders *et al*. 2009).

3.5.2 The Questionnaire

Questionnaires are one of the most widely used data collection methods in educational research. They help gather information on knowledge, attitudes, opinions, behaviours and other information, depending on what is being asked (Radhakrishna 2007). Graham and Hill (2003) also utilised questionnaires in their study regarding school transitions. They surveyed students to obtain feedback about ethnic minority groups and their transition experiences in comparison to the whole school population. Morgeson and Humphrey (2006) argue that questionnaires are also suitable for obtaining feedback about performance within organisations. It was hoped that information obtained from participants would identify transitional programmes in place in their schools.

The Survey Monkey tool (www.surveymonkey.com) facilitated the completion of the questionnaires. As the popularity of the internet increases, more segments of society are part of virtual communities, so the internet is being used for communication and information more frequently (Wright 2005). Smyth *et al*. (2004) also distributed questionnaires via post to school principals with the hope of exploring the way in which post-primary schools manage the transition process. There was a high response rate (78 percent) that amounted to 567 participants. Yet it is important to acknowledge that such surveys were distributed in 2002, a time when postal surveys were the most feasible mode of dispersal. Currently we are in an age where information technology prevails in everyday life, therefore online survey completion seemed more achievable than postal or perhaps telephone surveys. Computer software such as Survey Monkey is efficient as copious amounts of time is saved in data collection and analysis (Saunders *et al*. 2009). However, investigators can encounter problems when sampling using online surveys. Wright (2005) highlights the issue of 'self-selection bias'. This involves the 'certain' individuals who will undoubtedly complete the survey. This may inhibit the researcher's ability to make generalisations about study findings because a representative sample may not have been gathered. Yet, this is too an issue in more traditional methods of survey also. Access issues may also arise, if a gatekeeper or principal does not permit access to contact details of teachers in their organisations, very small sample sizes may occur.

3.5.3 Lesson Observations

Lesson observations allows the inquirer to gather 'live' data from naturally occurring situations. The reliance of second-hand accounts is not necessary as the researcher can observe directly what is happening by gathering primary data (Cohen *et al*. 2007). Saunders *et al*. (2009) recommends that if research questions are directly involved with what people do, then observations are suitable for gathering data because it provides a more personable account of what is trying to be deducted, unlike questionnaires. Therefore, to provide a varied interpretation, observations took place in both a primary and secondary school, where curriculum delivery through lesson facilitation was observed. The aim was to provide a comparison between teaching styles at both primary and post-primary levels. The researcher did not interact with the lesson facilitator, nor the pupils involved.

Lesson Observations were not employed in any of the studies relating to transitionary periods discussed in Section 2, therefore it could be considered as a somewhat unique approach to find comparative data from both primary and post-primary levels. Still, this technique does not come without shortcomings. Two observations took place in the researcher's workplace. Indeed, this provided ease of access and a prior understanding of the research site. However, when one is already exposed to a particular culture, preconceived ideas of sub-conscious bias may exist, causing deceptions in findings (Mulhall 2002). Colleagues known to the researcher may be too conscious of the added presence in their classroom, resulting in an unnatural exhibition (Cohen *et al*. 2007). Often formalised lesson observations can create participant anxiety that can drive such instructors to attain his/her optimum best (Zaidi 2017).

3.5.4 Alternative Methods Considered

Interviews and focus groups were also techniques that were considered for achieving the aims of this study. Interviews, often described as Qualitative Research Interviews (if structure is lacking) involves gathering assertions through the elicitation of meaningful stories, experiences and relationships that perhaps cannot be otherwise easily observed (Rossetto 2014). In their study in 2004, Smyth *et al.* interviewed students to obtain information about student knowledge during transition phases. Interviewing teachers was indeed also a possible research methodology option, however, the researcher anticipated possible challenges to the nature of this research study. Bryman (2012) state that interview transcription may be very time consuming, especially if data saturation is not reached in initial stages (Fusch and Ness 2015). Interviews were likely to occur in the researchers work place, where colleagues of the researcher could have been the interviewees. Therefore, boundaries would have had to been carefully maintained to protect the researcher-participant relationship and ethical obligation to do no harm (Rossetto 2014).

Focus groups were also a possible methodology considered, in that groups of many teachers would have been interviewed as opposed to one at a time. This could have improved the time efficiency when gathering research. Many second-year teachers were interviewed using focus groups in the TIMSS (2015) study in Ireland. Focus groups work well when participants feel comfortable and free to give opinions, without being judged. Yet for some individuals, selfdisclosure comes easily but for others it is may be difficult, additionally they can be difficult to schedule and may require two data collectors (Guest *et al*. 2017). In the case of the TIMSS study, data from the focus groups were audio recorded, later transcribed and subsequently analysed using NVivo (2015) software. Such ICT would not have been readily available to the researcher of this study, nor would the possession of skills be present for use of such software. Access to a second data collector was not feasible either.

Questionnaires are considered as having many advantages over other data collection methods such as interviews. These include the low economical cost, collection of data and the ability to reach larger numbers of a target population than if interviews were implemented (Jones *et al*. 2008). Furthermore, reiterating information from Section 3.5.3, observational research methods were not utilised in any of the studies discussed in Section Two. A decision was taken to employ this approach to see if useful assertions could be yielded, that varied from assertions found before.

3.6 Time Horizon and Sample Size

The research schedule (Appendix A) of this research was relatively short. The lesson observations took place over one month and the questionnaires were available online over two months during 2018. Graham and Hill (2003) distributed questionnaires to students experiencing the transition phase in May 2002 and then again in October 2002, suggesting that it was longitude research. Longitude studies involve data collection for at least two points in time to allow the researcher to detect changes (Connelly 2016). Therefore, the short Time Horizon of this study did not resonate with the characteristics of a longitude study. In contrast, it resembled a cross-sectional research design which involved the sample measurements occurring at a single point in time from both the questionnaire and lesson observations, despite the research recruitment period (Sedgwick 2014).

The limited time frame catalysed some issues in research implementation. Initially, it was hoped that a higher response rate would be received from the online questionnaire. Although there is no defined number for a correct sample size, typically an anticipated minimum of thirty cases per variable is an unwritten ‘rule of thumb’ (Cohen *et al*. 2007). It was hoped that at least 30 primary and 30 post-primary school teachers would have completed the questionnaire. Such a sample size (n = 60) would have had improved confidence and a greater ability to make generalisations about the overall picture of the transition phases. However, this did not occur, perhaps due to the restricted availability of the questionnaire. Nevertheless, sometimes it is disputed that sample sizes are unimportant in qualitative and quantitative data (Sandelowski 2007). A higher than normal response rate does not prove unbiased findings and conversely, a lower than normal response rate does not mean that responses are biased (Saunders *et al.* 2009). Certainly, it is important to consider that larger sample sizes will typically yield greater variability. To conclude, the Time Horizon may have impacted the variability of the data findings due to its short nature.

3.7 Ethical Considerations

3.7.1 Ethical Considerations: Lesson Observations

Before any research took place, permission was sought from managerial gatekeepers of the schools involved in the lesson observations. Information leaflets (Appendix B) and consent forms (Appendix C) were distributed to principals in the relevant catchment areas. When the principals consented to partake in the study, teachers were also provided with an information sheet (Appendix D) and a consent form (Appendix E). Informed consent provides rights to freedom and self-determination to those willing to participate in the study (Cohen *et al*. 2007). If teachers wished to participate, then forms were signed, returned and a date was scheduled for the lesson observation. After the lesson observation took place, analysed data was sent to teachers to review and identify possible protruding misinterpretations. Parental consent was not necessary as the researcher did not engage with students in any way throughout the lessons.

It is important to acknowledge that there was a dependable relationship between the researcher, post-primary teachers and students as one lesson observation took place in the researcher's workplace. Some students were personally known to the researcher and teachers involved were work colleagues. Additionally, participants known to the researcher could have felt pressurized to take part in the study. However, there were no risks posed to participants as continual assurance and transparency were also provided to all participants about the right to refuse and the strict confidential practices employed throughout the research process.

Retrospective vetting applies to recognised schools and centres of education that employ, contract, allow or place persons in work or activities with children or vulnerable people (Ireland, DES 2018). Therefore, the researcher required Garda vetting to observe the lessons in the primary school in question. An application was submitted to the Dioceses of Raphoe, who is the organisation responsible for the vetting procedures for primary schools in many parishes in County Donegal. Vetting was not required for the post-primary setting as it was the researcher's workplace, and they were fully registered with the Teaching Council of Ireland. This is the authorised body for administrating vetting for employed post-primary teachers in Ireland (The Teaching Council 2018).

3.7.2 Ethical Considerations: The Questionnaires

Email addresses for a myriad of primary and post-primary schools throughout County Donegal were obtained from 'School Days', which is a website that provides educational information nationally. The researcher sent an email outlining the research purpose. Information sheets (Appendix B) and a link to the online questionnaire host Survey Monkey were also attached. Consent was assumed by the gatekeeper if the link was forwarded to relevant mathematics teachers. An information sheet for participants was also attached in this email (Appendix F). Teachers then voluntarily consented by choosing to participate by clicking on the link and by completing the survey fully. Participants were not known to the researcher, nor was Personally Identifiable Information (PII) obtained. If PII is not involved, then privacy harm is significantly reduced (Schwartz and Solove 2011). This confidential data gathering method eliminated ethical issues as all teachers were over eighteen years of age and remained anonymous.

3.7.3 Rights of Research Ethics

Data collected was accessible to only the primary researcher throughout the study. The assigned project supervisor also had access to data, if required. Data gathered, processed and stored, was in compliance with the appropriate Data Protection legislation, set out in LYIT's Guidelines for Electronic Data Storage.

Teachers who participated in the lesson observations had the right to withdraw from the study up to the point of data analysis (June 2018) and teachers who completed the online survey were able to withdraw from the study up to the point of their survey completion. All participants were informed about how research findings would contribute to the MALT programme, and possibly in other educational fields. Finally, there were no risks posed to subjects by participating in this research and all data gathered and used throughout the study was anonymised (Wilson 2016).

3.8 Data Collection

3.8.1 Data Collection: Questionnaire

The questionnaire used in this study (Appendix G) consisted of a semi-structured set of questions that comprised of closed and open questions (Hague *et al*. 2003). This was to extract a variety of anonymous responses from teachers about their perceptions of the transition from primary to post primary. Questions were designed to obtain information about teaching methodologies and were created using evident common themes from curricula at primary and post-primary level. Once the research recruitment stage terminated, research findings were summarised with descriptive statistics using Survey Monkey. The use of descriptive statistics allows data to be easily summarised and presented, patterns can then be more easily identified. This software provided by Survey Monkey also enabled data from primary and post-primary school teachers to be analysed exclusively, even though they all completed the same questionnaire from the one unique link.

3.8.2 Data Collection: Lesson Observations

Data was gathered from the lesson observation using a structured observational technique. Explicit formulated rules and recording of behaviour should be incorporated when implementing structured observations (Bryman 2012). The template used for the lesson observation (Appendix H) included sections for anticipated findings. It also purposely included similar formulated segments for the lesson observations at both primary and post-primary. This was to provide comparative data with ease. Generally, classroom observations are unstructured to alleviate the contextualised assertions that may arise (Bottema-Beutel *et al.* 2014). However, this research was primarily looking for similarities between teaching methodologies, so structured observational techniques were preferred. Although its relevance was noted, context was almost divorced from the aspects of teaching and learning observed. Additional findings that occurred outside the remit of the formulised structure were also acknowledged. Once all data was gathered from the lesson observations, common themes, differences and additional findings were ordered in a categorical nature and like the questionnaire, analysed using descriptive statistics.

3.9 Reliability and Validity

Validity refers to whether a research method investigates what it was designed to address in the offset (Petty 2009). If aims are not investigated using reliable approaches, then findings could be deemed worthless. Reliability is the degree to which results are consistent over time, inferring that an accurate representation of the population could be reproduced under a similar methodology (Golafshani 2003). In this mixed methods approach, a 'Sequential Exploratory Strategy' recommended by Creswall (2009) was employed. The first stage of data collection occurred after the qualitative stages (observations). Soon after, data was gathered from the quantitative approaches (questionnaires) employed. It was envisaged that findings from the observations and questionnaires would create a symbiotic relationship, in that their findings would complement each other. This triangulation of mixed methods should have strengthened the validity of assertions found.

Qualitative research is often criticised for lacking scientific rigour. This is sometimes due to the lack of transparency in the analytical procedures and the possession of personal values in the findings, resulting in research bias (Noble and Smith 2015). Due to the Interpretivist nature of this study, the researcher acknowledged the need for objectivity when data collecting throughout the research recruitment period. A thorough attempt to divorce meaningful values from the research conduction was made (Bryman 2012). To ensure further credibility in research findings, other measures were implemented also.

Noble and Smith (2015) also favour the engagement with other researchers to reduce bias. Once the data was analysed, peer examination took place. Two colleagues of the researcher, who were not involved in the study, reviewed the findings. This provided clarification and further transparency. Peers who are not researchers should regularly meet to review and critique the version of data collected by the researcher before findings are finalised (Lincoln and Guba 1985 cited in Wilson 2016).

Finally, 'member checking' took place once data was analysed. The teachers who taught in the lesson observations were sent a copy of the data analysis to review. If protruding misconceptions occurred on the researcher's behalf, they were then discussed and rectified if necessary. This strategy of revealing research materials to the participants ensures that data has been investigated efficiently, thus decreasing the likelihood of misinterpretation in findings (Krefting 1991). However, Krefting also outlines a possible limitation of member checking. Some participants may not favour findings, or they may not necessarily agree with assertions, therefore careful consideration, professionalism and sensitivity prevailed in this process.

Due to the small-scale and localised nature of this study, validity and reliability were greatly considered. If addressed efficiently, findings can have improved credibility which in turn generates a greater ability to generalise assertations (Pearlman and Schmidt 1980).

3.10 Evaluation

3.10.1 Data Analysis of the Questionnaires

A total of 33 questionnaires were completed and data was represented using both pie charts and bar charts. In the instances where common themes arose within questions, such findings were discussed collectively as opposed to separately.

Questionnaire: Question One

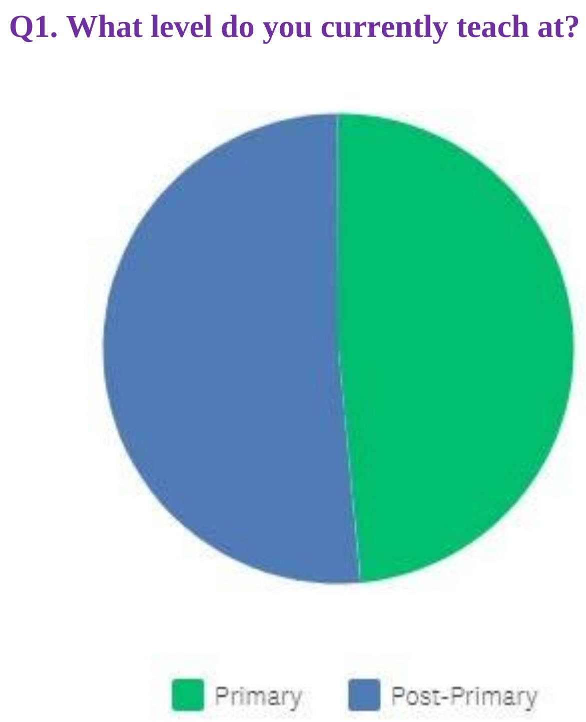

Figure 3.2 Response breakdown of primary and post-primary teachers to "What level do you currently teach at?".

With a total of 33 responses, the breakdown of the professions is almost equal, with 48% being primary teachers and 52% being post-primary teachers.

Questionnaire: Question Two

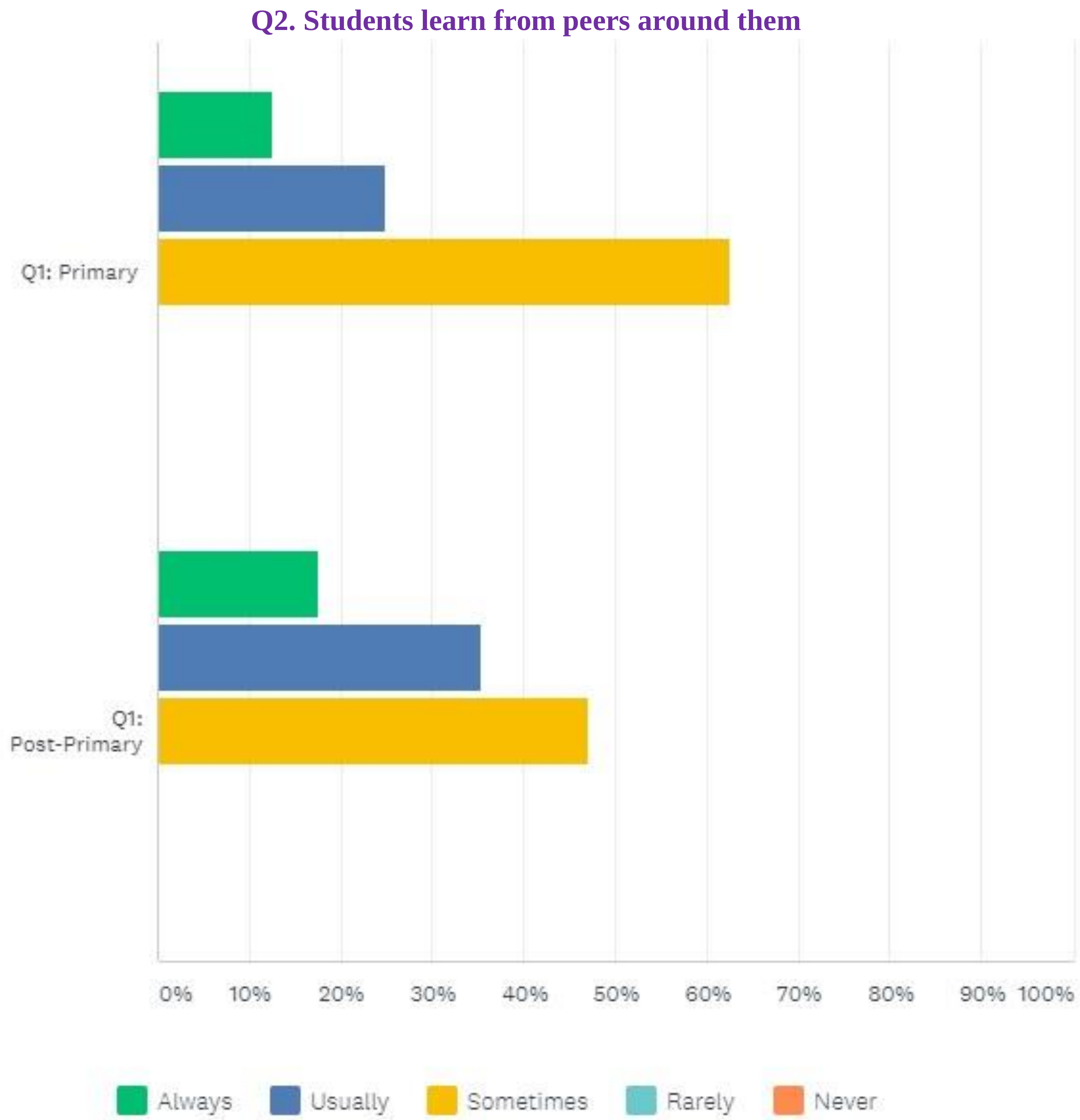

Figure 3.3: Primary and Post-primary teachers responses to "Students learn from peers around them".

In the responses to this question, 18% of post-primary teachers and 13% of primary teachers selected "Always", while 35% of post-primary teachers and 25% of primary teachers selected "Usually". 47% of post-primary teachers and 63% of primary teachers selected "Sometimes". No teachers chose "Rarely" or "Never" in this question.

The Primary School and the Junior Certificate Mathematics curricula encourages a constructivist approach, where children should be active when learning involving the sharing, explanation and justification of solutions strategies (Ireland DES 1999; NCCA 2016). Peer learning aids future learning and assists the achievement of learning outcomes, regardless of their sophistication (Zepke 2018). Self-esteem can be improved for the peer leaders while the learners gain greater social support thus improving confidence for all (McLeod *et al*. 2018). Peer learning is considered a more active methodology rather than individual learning which could be categorised as traditional. Indeed, peer learning has many benefits, however, Boud *et al*. (1999) argue that existing assessment practices may act to contradict the goals of collaborative learning. If assessment gives the student the message that only individual achievement is valued, then students may view co-operative learning as pointless or akin to cheating. Yet Boud *et al*.'s argument may not be as applicable to the teaching and learning at primary level, especially when assessment practices are formative practices for most of the academic years at this level. Perhaps teachers at post-primary level are conscious of this fact due to the more summative nature of the Junior certificate mathematics curriculum and assessment at present. Nevertheless, there appears to be little variation between responses, indicating that students do learn from the peers around them at least some of the time. Responses indicate that peer collaboration does appear to be slightly more frequently used at post-primary level.

Questionnaire: Question Three

Q3. Students communicate information to help solve practical problems

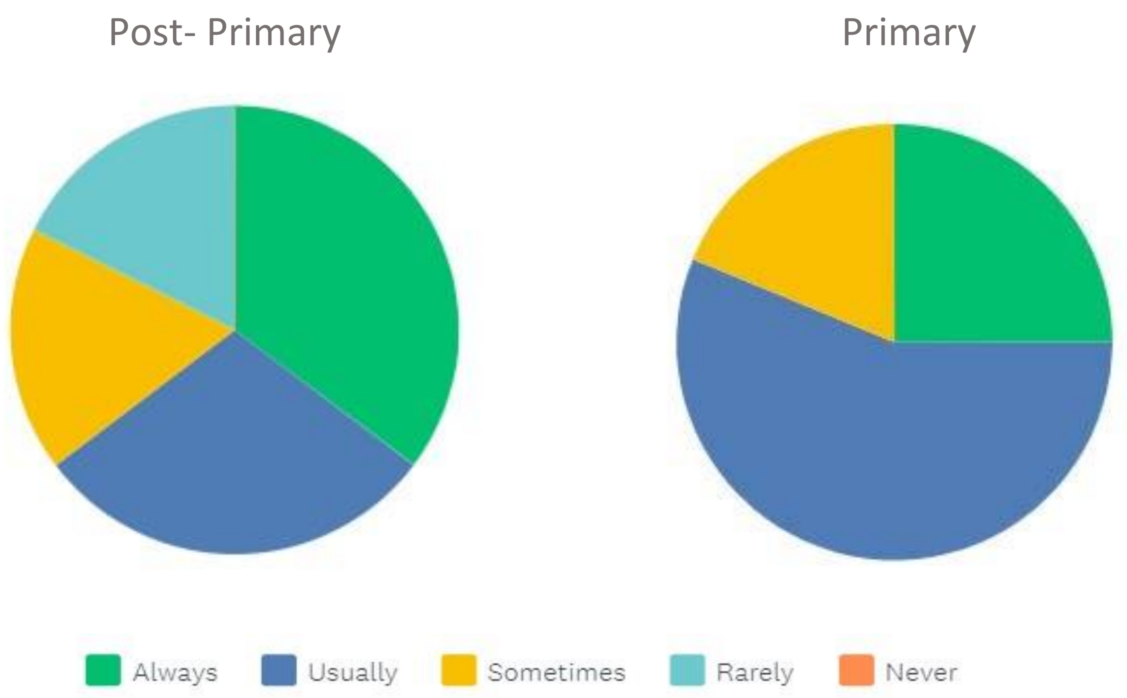

Figure 3.4: Comparative pie charts showing responses to "Students communicate information to help solve practical problems".

In the responses to this question, 35% of post-primary teachers and 25% of primary teachers answered "Always", while 29% of post-primary teachers and 56% of primary teachers answered "Usually", 18% of post-primary teachers and 19% of primary teachers chose "Sometimes" whereas 18% of post-primary teachers answered "Rarely".

This infers that students must communicate information to solve practical problems at least on some occasions. Both curricula at primary and post-primary refer to collaborating with peers to help solve problems. Students should be encouraged to communicate mathematical ideas to develop numeracy skills (Ireland DES 1999, NCCA 2016). However, the attitudes of students toward peer work are not always positive, as some feel uncomfortable and insecure and then become resistant to tasks posed (Pombo and Talaia 2012). Petty (2009) also argues that group work may not always be effective if used too often. Sometimes the group can be hijacked by a determined individual.

Other members are then considered passengers by becoming reliant on the leader to complete tasks. Reiterating the findings mentioned previously in Section Two, the report published by the NFER in 2013 criticised teaching and learning as being traditional. Additionally, very little collaboration was observed. These findings would reverberate with the 18% of the postprimary teachers who chose “Rarely”, despite the huge emphasis that is placed on communication promotion in mathematics lessons in the curricula.

At the same time, it is possible to conclude that some curriculum continuity is in effect between both levels from the findings in question three and four. As mentioned previously, curriculum continuity is a crucial component of successful transition practices (Evangelou *et al*. 2008). It is evident that students do learn from peers around them and communicate to solve problems for the most part. Hence an overlap of teaching methodologies exists between the primary and post-primary participants.

Questionnaire: Question Four

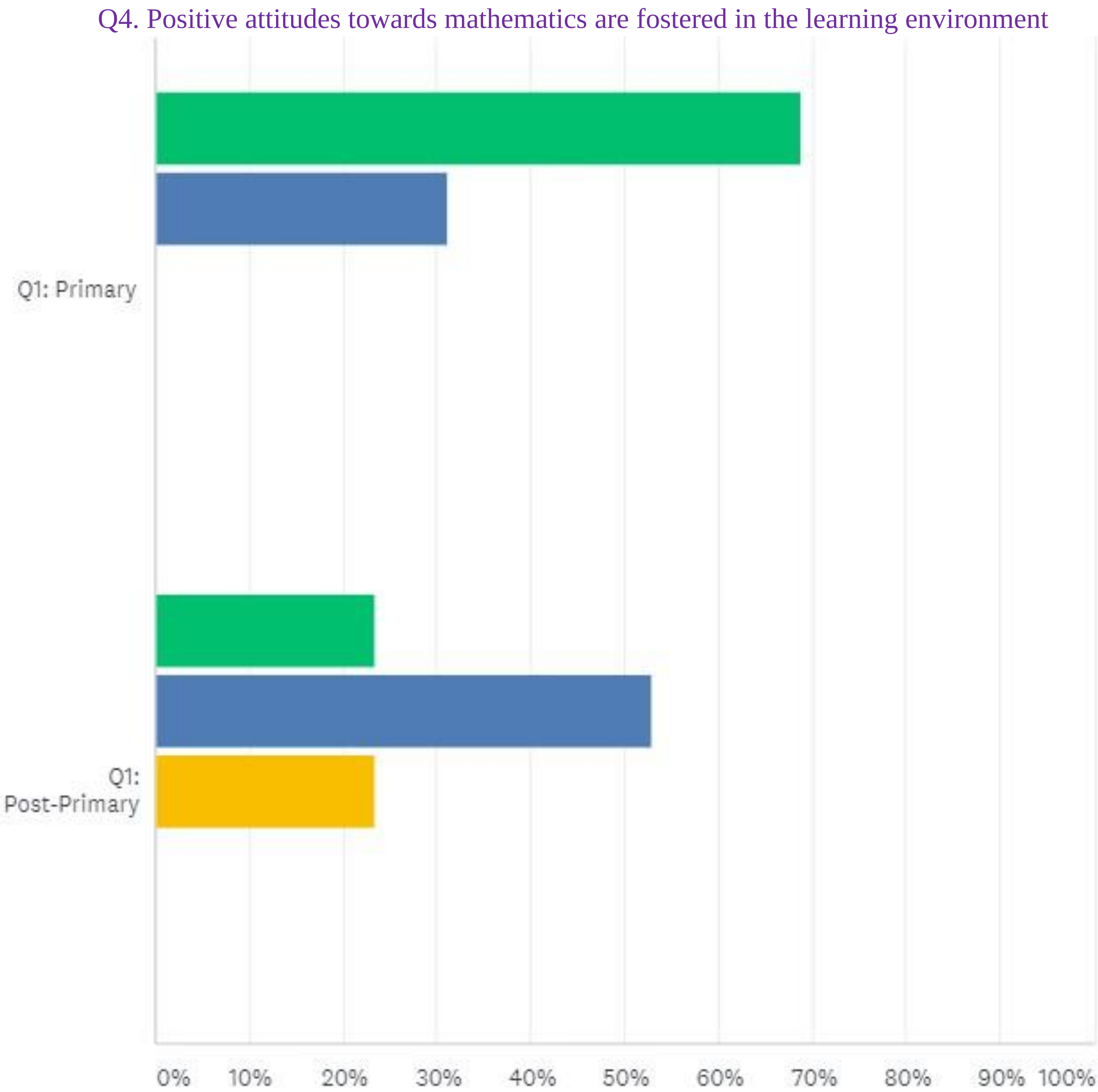

Figure 3.5: Post-primary and primary responses to "Positive attitudes towards mathematics are fostered in the learning environment".

In the responses to this question, 24% of post-primary teachers and 69% of primary teachers chose "Always", while 53% of post-primary teachers and 31% of primary teachers chose "Usually", and, 24% of post-primary teachers chose "Sometimes".

Sparrow and Hurst (2010) argue that adults' attitudes to mathematics come from experiences in their former years in education. Fostering a positive attitude towards the subject can yield better performance. In 2015, the TIMSS found that 61.3% of Irish students in second year reported that they like mathematics. However, just 48.3% reported that they like learning mathematics. Alarmingly, it was the students who liked learning the subject who scored excessively higher on TIMSS mathematics than those who did not like learning mathematics (Shiel and Kelleher 2017). Evidently, the teacher must profess positivity when facilitating learning to create an affirmative learning environment for students. In this question, only 24% of post-primary teachers responded "Always" which is significantly lower than the 69% of primary teachers who answered "Always". Although it appears that a positive attitude is fostered most of the time when 53% of post-primary teachers chose "Usually", and 24% chose "Sometimes". Nevertheless, it seems that primary school teachers reported a higher incidence of fostering a positive attitude when teaching mathematics. The variety of responses here do however suggest that teachers answered honestly, thus proving that self-selection bias did not occur.

Questionnaire: Question Five

Q5. Students recognise real-life applications of mathematics by engaging with real-life problems

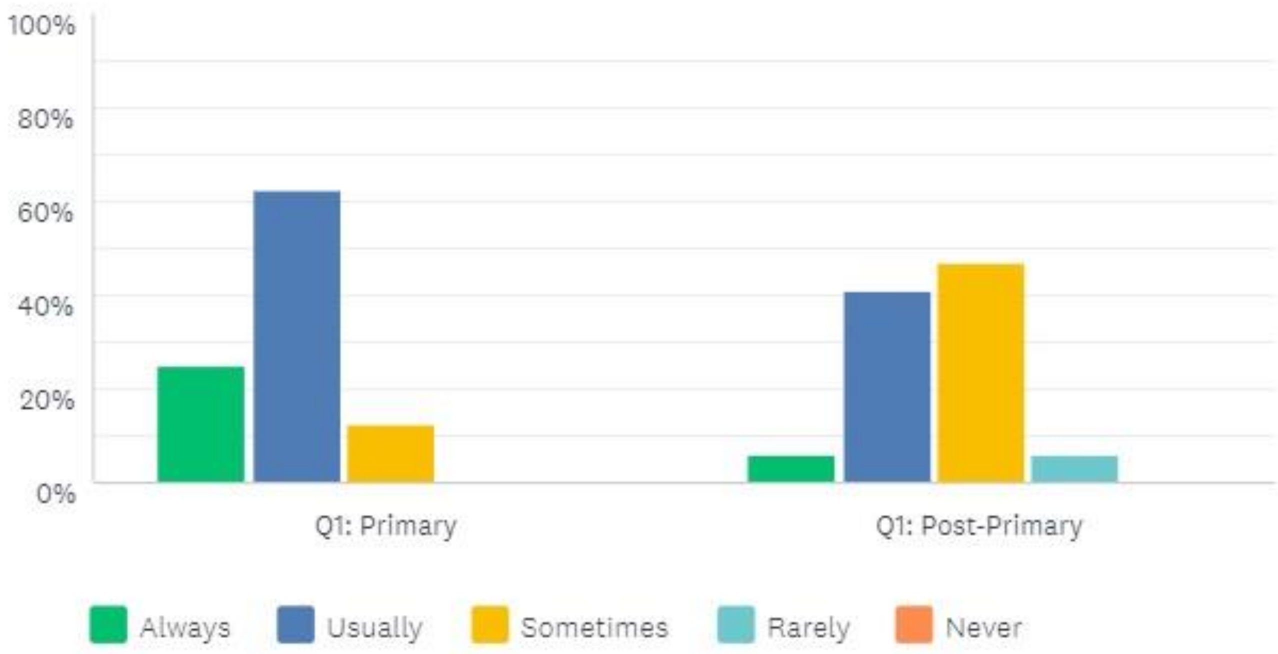

Figure 3.6: Bar charts showing the primary and post-primary responses to "Students recognise real-life applications of mathematics by engaging with real-life problems".

In response to this question, six% of post-primary teachers and 25% of primary teachers answered "Always", while 41% of post-primary teachers and 63% of primary teachers answered "Usually", 47% of post-primary teachers and 13% of primary teachers answered "Sometimes" and six% of post-primary teachers answered "Rarely".

It is clear from the data that primary school teachers reported the use of real-life applications of mathematics more commonly than the post-primary teachers. Both mathematics curricula encourage the use of meaningful contexts as students can therefore recognise mathematical connections in every day practices (NCCA 2016, Ireland, DES 1999). Often students will ask "why are we doing this?" or "when will we use this in our lives?" when tasks are presented during mathematics lessons (Sparrow 2008). Therefore, it is imperative to show the relevance of mathematics in everyday tasks, for future work place applications and more importantly to make the subject interesting for students. Like most, students find something more interesting if it relates directly to their own lives (Petty 2009). However, in TIMSS in 2015, over one third of second-year students disagreed that they learn many interesting things in mathematics (Shiel and Kelleher 2017). That said, it is difficult to appeal to all students at any given time. Issues such as relevance coupled with the demands of teaching mathematics can make it difficult to implement simultaneously all the time (Sparrow 2008), this is apparent in the data findings for this question, especially for the post-primary teachers.

Questionnaire: Question Six

Q6. Teaching and learning is student-centred i.e. approaches used are wholly based on the interactions and engagement of the students in the classroom.

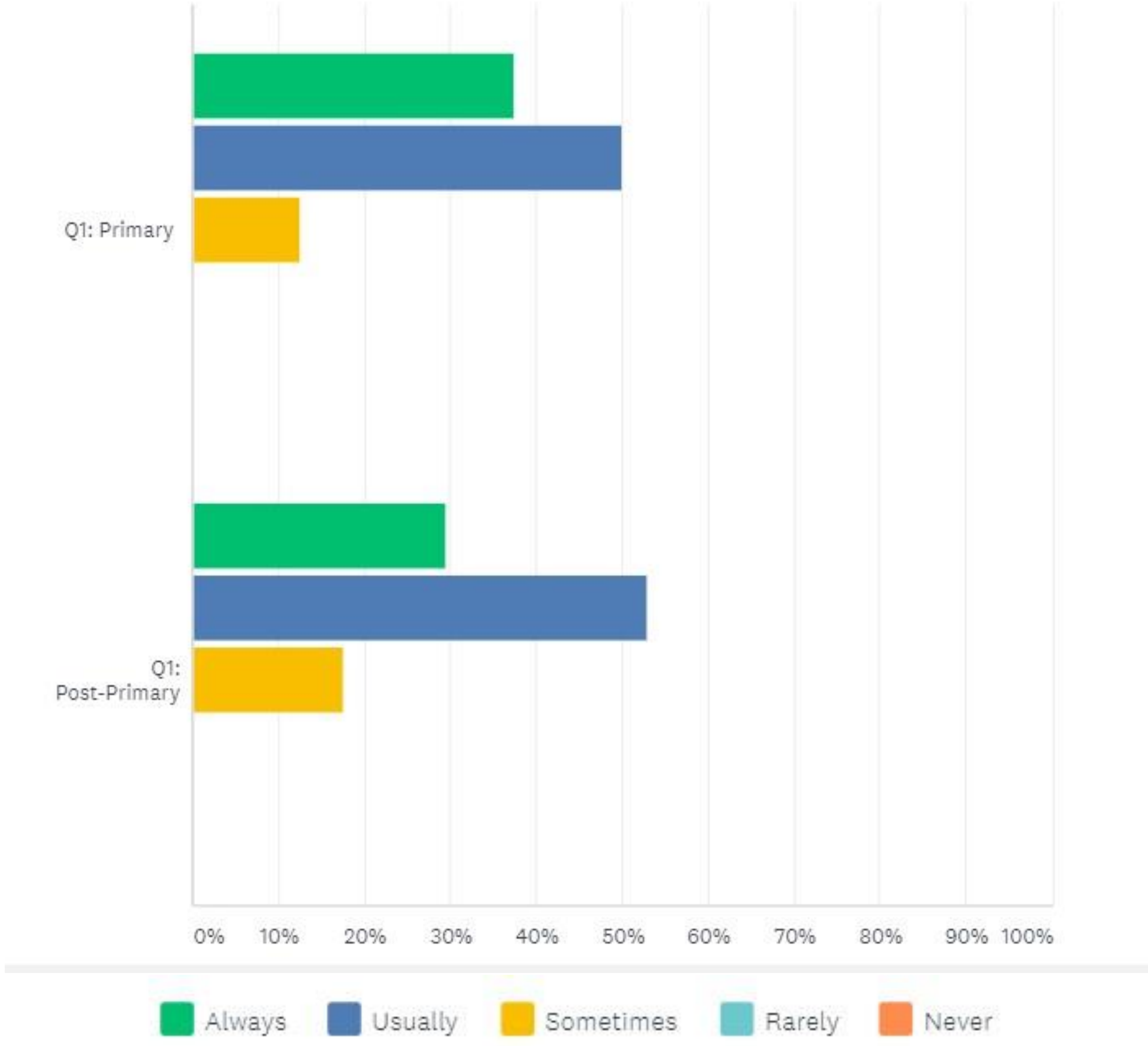

Figure 3.7: Post-primary and primary school responses to "Teaching and learning is student-centred i.e. approaches used are wholly based on the interactions and engagement of the students in the classroom".

In the responses to this statement, 29% of post-primary teachers and 38% of primary teachers answered "Always", 53% of post-primary teachers and 50% of primary teachers answered "Usually", while 18% of post-primary teachers and 13% of primary teachers answered "Sometimes". Neither groups of teachers selected "Rarely" or "Never".

There is a relative difference for the two groups of teachers between the responses of “Always”, but the other percentages are quite similar. Still, student-centred teaching is more common in the primary school responses by almost 10% for the “Always” response. Traditionally, curricula focused on the teacher as opposed to the learners in education. However, in recent years, there has been a change, moving from ‘teacher-talk’ to placing emphasis on SCL (O’ Neill and Mc Mahon 2005). SCL should provoke active learning, responsibility for learning, and an interdependence between teachers and students. Perhaps teaching methods are affected by the assessment practices employed in both levels. Reiterating the argument regarding the differences in assessment practices; primary school teaching permits the use of AfL methods more so than post-primary teaching. AfL may scaffold SCL activities more favourably than AoL methods, particularly when most of the summative assessments at post-primary level at present are individual tests. Certainly, AfL strategies are utilised at post-primary level, however, as outlined in Section Two, some teachers are often criticised for teaching to the test (Popham 2001) due to the summative nature of the assessments at Junior and Leaving Certificate level.

Questionnaire: Question Seven and Eight

Q7. Students use a variety of resources to enhance learning.

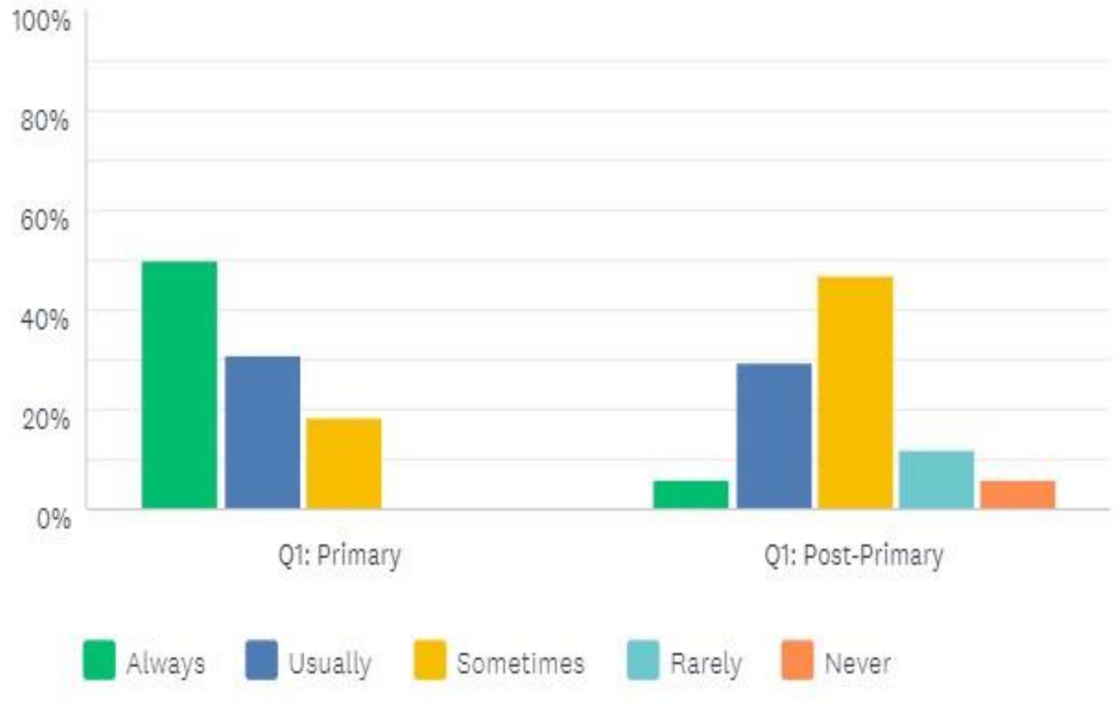

Figure 3.8: Primary and post-primary responses to “Students use a variety of resources to enhance learning”.

In response to this statement, six% of post-primary teachers and 50% of primary teachers answered “Always”, while 29% of post-primary teachers and 31% of primary teachers answered “Usually”, 47% of post-primary teachers and 19% of primary teachers answered “Sometimes” and 12% of post-primary teachers chose “Rarely”.

It is interesting to note that six% of post-primary teachers chose “Never”. There is an undisputable difference between the data reported from the post-primary and primary teachers for this statement, particularly in the response to “Always”. All primary school teachers reported that they used a variety of resources either “Always”, “Usually” or “Sometimes”. This was not the case for the post-primary teachers as a total of 18% chose either “Rarely” or “Never”. Such a contrast in this data does not correlate with the recommendations set out by the primary and post-primary curricula and teaching guidelines. Effective use of resources should help to fortify and extend learning by constructing knowledge and developing skills (Maths Development Team 2018).

It appears that the benefits of effective resource use may not be prioritised by the post-primary teachers. The responses to question eight of the questionnaire below contains categories of the resources listed by the participants (Tables 3.1 and 3.2). It is evident that a wider range of resources are used by primary teachers. One could argue that most of the resources listed by the post-primary teachers were either websites or materials needed for examination purposes, such as “exam papers”, “log tables” and the website www.examinations.ie.

In an evaluation of the impact of Project Maths on the performance of students in Junior Cycle in 2017, many teachers reported that there is not sufficient time to implement the course (Shiel and Kelleher 2017). Restating the point regarding assessment practices, perhaps primary school teaching and learning of mathematics accommodates the use of more resources as assessment practices are more formative based. Harlen (2005) argues that AoL can have a high-stake impact on teaching, and as a result, teachers may teach to the test (Popham 2001) by focusing on the content of the tests and therefore fail to employ AfL methods. Thus, time for the use of a variety or resources may not be prioritised due to the nature of the terminal exam in the Junior Certificate, which does not require many resources.

Q8. Could you briefly list common resources used if you chose "Always", "Usually", "Sometimes" or "Rarely" in question 7. If "Never" was chosen, type "N/A".

ICT	Websites	Books	Mathematical Games	Mathematical Equipment	Miscellaneous
Computer tablets e.g. iPads Computers Calculator Mathematical Applications PowerPoints	youtube.com examinations.ie geogebra.org tes.co.uk scoilnet.ie Pinterest.com	Text books Examination Papers Log tables	Tarsia puzzles	Probability Kit Geometry Set Clinometer Geostrips Solid 3-D shapes	Traffic Lights for evaluating Learning (AfL method). Mini whiteboards

Table 3.1: List of resources mentioned in post-primary responses to Question Eight.

ICT	Websites	Books	Mathematical Games	Mathematical Equipment	Miscellaneous
Computer tablets e.g. iPads Computers Calculator Mathematical Applications Interactive cube e.g. Izak 9	youtube.com ixl.com izak9.com	Text books Posters Graphs Catalogues Worksheets Puzzle books	Tarsia puzzles Playing cards Multiplication squares Magic squares Loop cards Dominoes Base ten sets Numicon sets Chess Draughts Dienes blocks Target board Hit the button	Dice Geometry Set Solids and nets of 3-D shapes Clocks Number lines Unifix cubes Geoboards Rubik cube Tangram sets	Mini whiteboards Environmental shapes around the school Colours Money Price tags Lollipop sticks Capacity beaker Trundle wheel Weighing scales Real cakes for showing fractions

Table 3.2: List of resources mentioned in primary responses to Question Eight.

Questionnaire: Question Nine

Q9. "I consult the primary school curriculum when designing mathematical lessons"

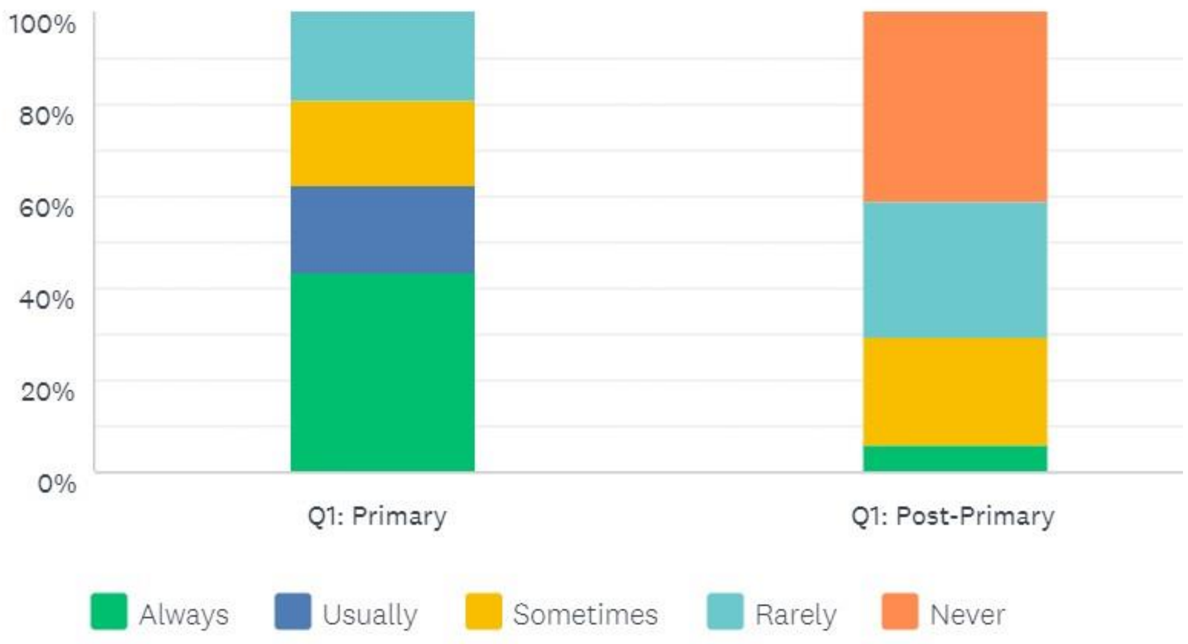

Figure 3.9: Responses from primary and post-primary teachers to "I consult the primary school curriculum when designing mathematical lessons".

In the responses to this statement, six% of post-primary teachers and 44% of primary teachers chose "Always" while 19% of primary teachers only chose "Usually", 24% of post-primary teachers and 19% of primary teachers chose "Sometimes", 29% of post-primary teachers and 19% chose "Rarely" and 41% of post-primary teachers chose "Never".

Based on these findings, it can therefore be assumed that student prior knowledge may not be considered when post-primary teachers are designing mathematical lessons, even though it can provoke an ability to consolidate recall and scaffold new information (Brod and Shing 2016). If previous knowledge is not acknowledged, then it may be difficult for students to progress moving forward. In addition, as outlined in Section Two, the Junior Certificate places great emphasis on a 'bridging framework for mathematics' as it expects primary and post-primary school teachers to consult relevant documents to facilitate improved continuity between both levels. Also, perhaps post-primary teachers are over-reliant on the CIC and as a result do not feel that reviewing the mathematics primary curriculum is necessary when designing lessons.

Yet, this poses a risk of ‘over-teaching’ content. Reiterating findings from Galton *et al*.’s study in 1999, there is a recurring threat of curriculum overlap, causing students to become bored by revisiting similar course work, particularly if they had high expectations of challenging work moving forward. The primary school curriculum and the CIC should be evaluated for this reason to ensure such repetition of curricula objectives does not saturate mathematic lessons with comparable content.

Q10. I consult the Junior Certificate mathematics syllabus when designing mathematics lessons.

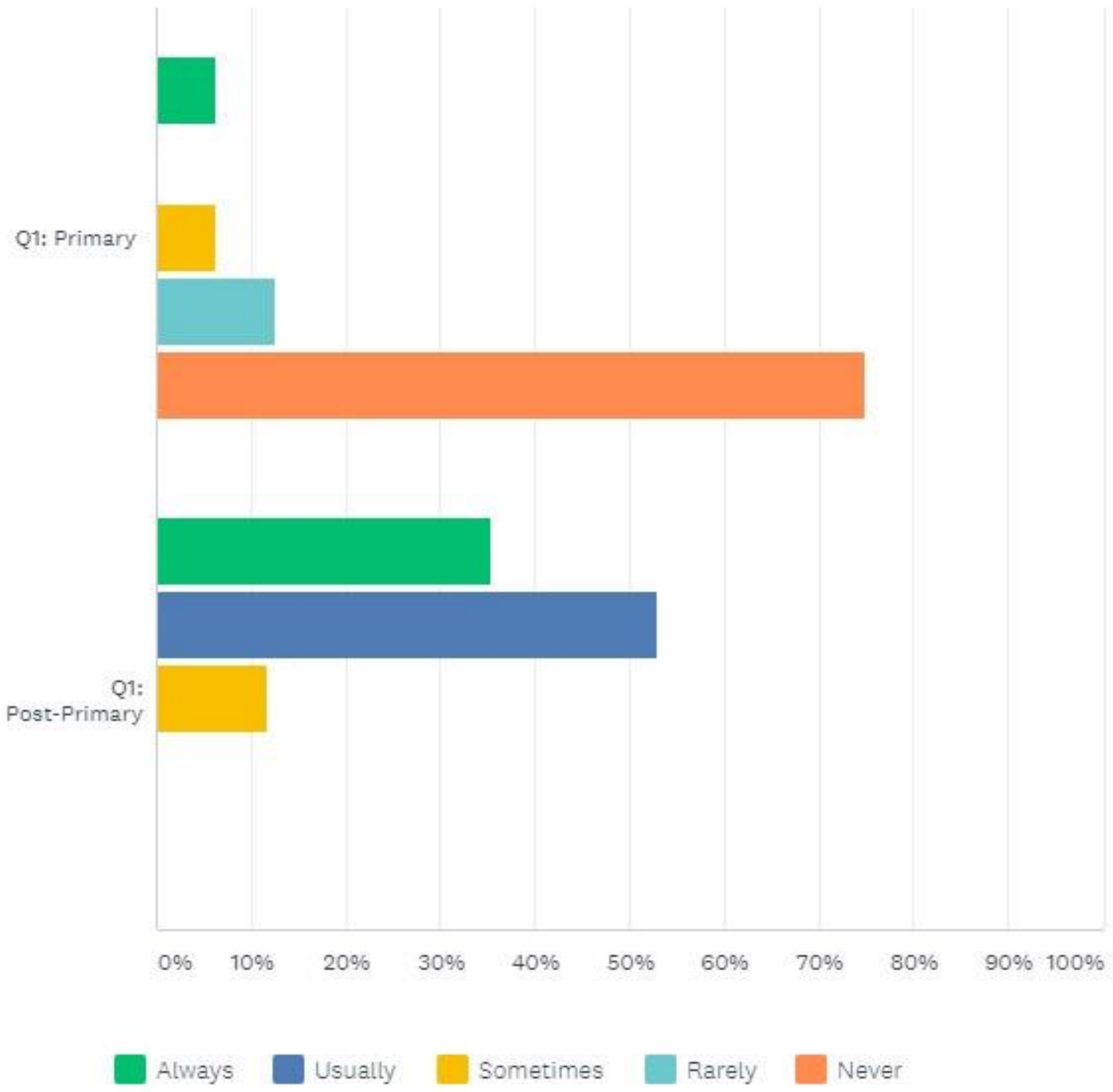

Figure 3.10: Responses from primary and post-primary teachers to "I consult the Junior Certificate mathematics syllabus when designing mathematical lessons".

In response to this question, 35% of post-primary teachers and six% of primary teachers chose "Always", while 53% of post-primary teachers answered "Usually", 12% of post-primary teachers and six% of primary teachers chose "Sometimes" and 13% of primary teachers chose "Rarely". 75% of primary teachers chose "Never".

These findings are very similar to the findings from question nine. A hugely significant figure (88%) of primary school teachers reported that they rarely or never refer to the Junior Certificate mathematics syllabus, despite the advantages of doing so. Dallot (2013) states that if a ‘cognitive set’ is present in lessons, then learning is easier consolidated. A cognitive set is structured, providing mental preparation for individuals that eases the assimilation of new content or new experiences. Dallot also argues that linkages between prior and new content creates a relevant learning sequence and thus an appreciation of learning continuity. This principle of applying a ‘cognitive set’ during the senior years would help with transitionary periods but, of course, primary school teachers would need to consult the Junior Certificate syllabus to yield the benefits. Additionally, this could alleviate the high levels of stress and uncertainty experienced by students during transitionary phases, alluding to Galton *et al*.’s study in 1999. Yet, it could be possible that the primary school teachers are confident that the repetition of the fifth and sixth class content in the CIC will suffice for students moving forward and therefore do not feel that they need to consult the Junior Certificate mathematics syllabus.

Questionnaire: Question Eleven

Q.11 I adapt teaching methodologies to create a continuum in learning of mathematics for students who transfer from primary to post-primary.

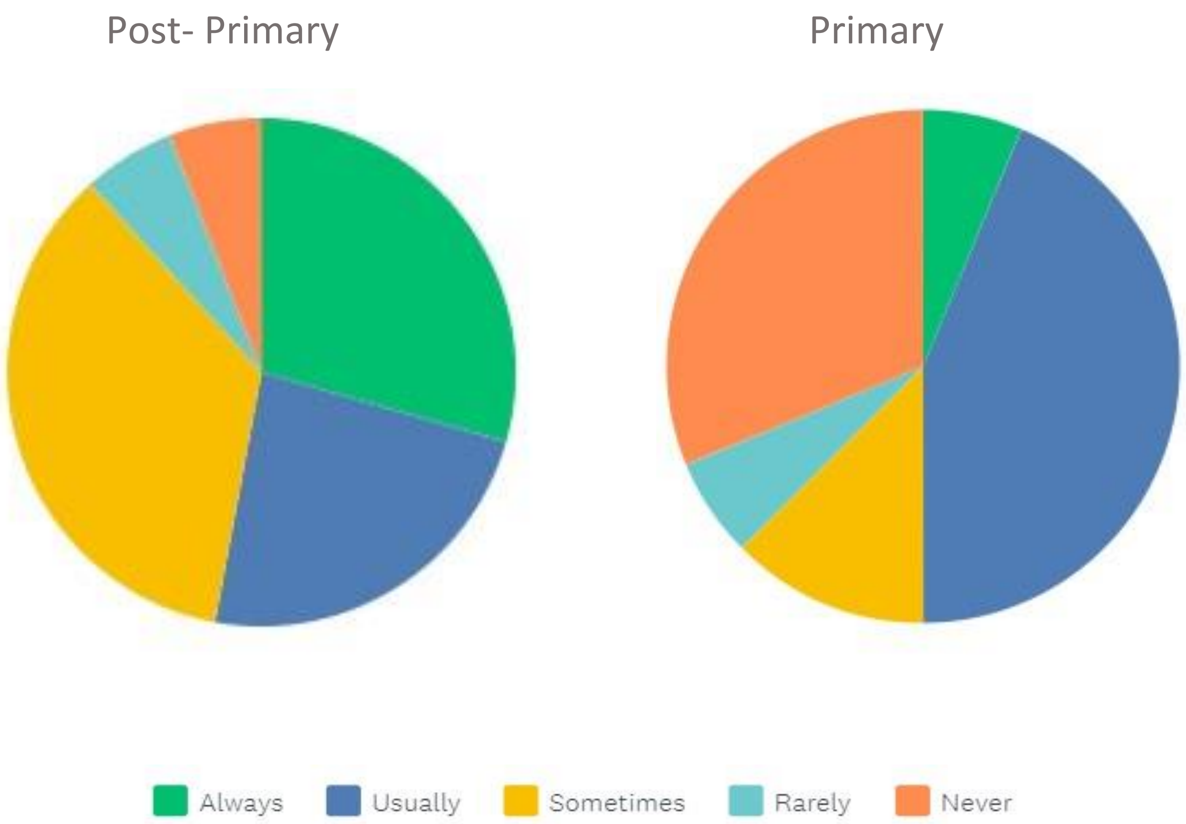

Figure 3.11: Breakdown of responses from post-primary and primary teachers to "I adapt teaching methodologies to create a continuum in learning of mathematics for students who transfer from primary to post-primary school".

In response to this statement, 29% of post-primary teachers and six% of primary teachers chose "Always", 24% of post-primary teachers and 44% of primary teachers chose "Usually", 35% of post-primary teachers and 13% of primary teachers chose "Sometimes", while six% of postprimary teachers and six% of primary teachers chose "Rarely". Also, six% of post-primary teachers and 31% of primary teachers chose "Never".

The vast majority of post-primary participants (94%) claim to adapt teaching methodologies in order to create a continuum in learning of mathematics for at least some of the time. In contrast, approximately 66% of primary teachers answered similarly. It is apparent that curricula continuity is regarded as being important to some degree by such teachers. These teachers, therefore, may not cling onto the 'fresh start' of school associated with the transitionary phases (Galton *et al*. 1999). However, it could be argued that perhaps there is an over reliance on the CIC, as mentioned previously. Additionally, one could argue that the findings from Question Ten could diminish the validity of these responses as the consultation of the curricula should occur in order to adapt methodologies to ease the transition process. In previous studies of educational transition, it has been found that primary schooling did not prepare students adequately for subjects at post-primary level and often they presented at second level without adequate numeracy skills (Smyth *et al*. 2004; Shiel and Kelleher 2017). Perhaps teaching methodologies are not being adapted effectively.

Q12. I collaborate with primary school teachers to gain insight into aspects of teaching and learning of mathematics at primary school level

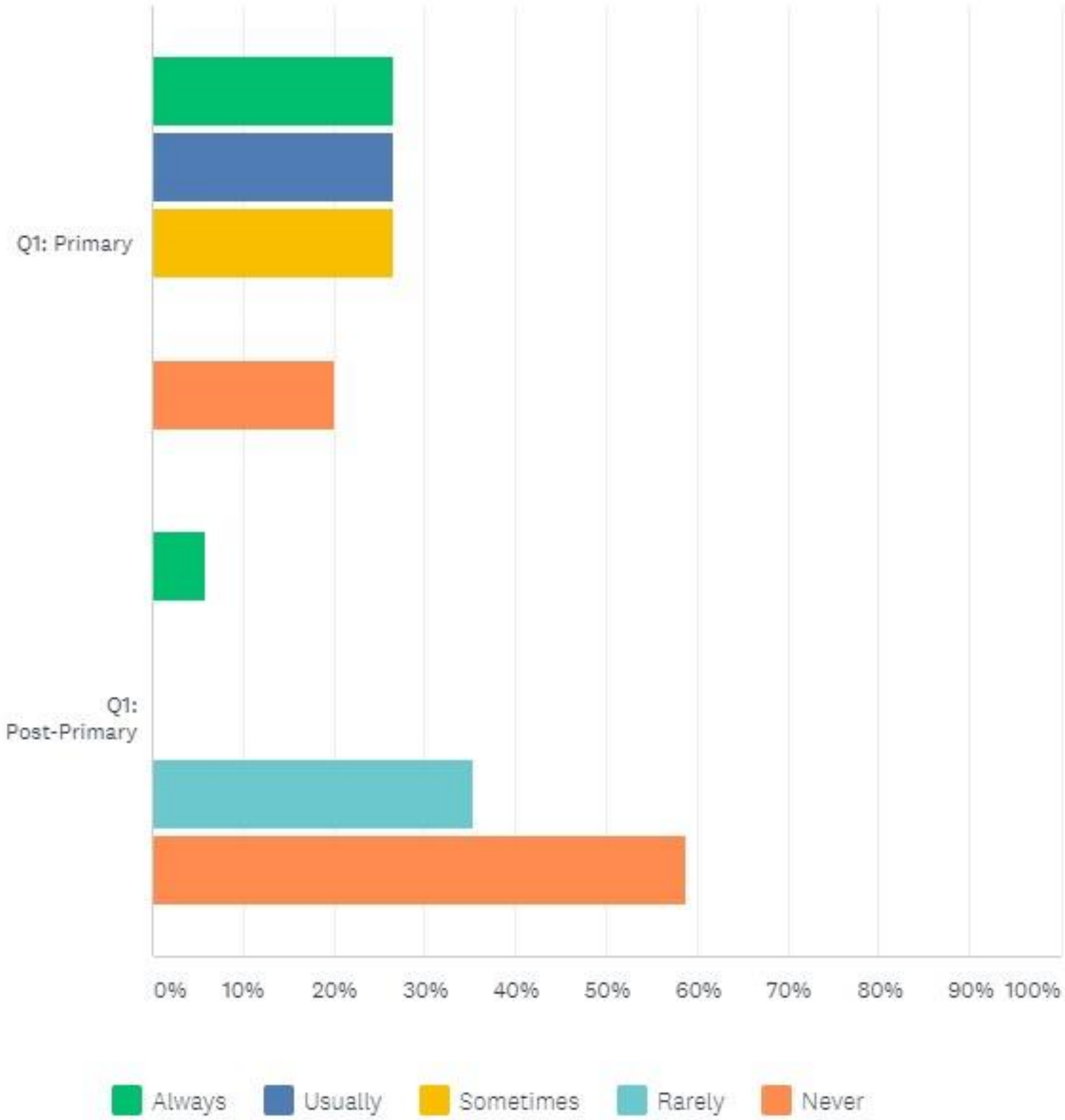

Figure 3.12: Bar chart with responses to primary and post-primary teachers to "I collaborate with primary school teachers to gain insight into aspects of teaching and learning of mathematics at primary school level".

In responses to this question, six% of post-primary teachers and 27% of primary teachers answered “Always”, while 27% of primary teachers answered “Usually” and 27% of primary teachers answered “Sometimes”. 35% of post-primary teachers answered “Rarely” and 59% of post-primary teachers and 20% of primary teachers answered “Never”.

Note: Findings for Question Twelve will be discussed collectively with assertions from Question Thirteen.

Q13. I collaborate with post-primary teachers to gain insight into aspects of teaching and learning of mathematics at post-primary level.

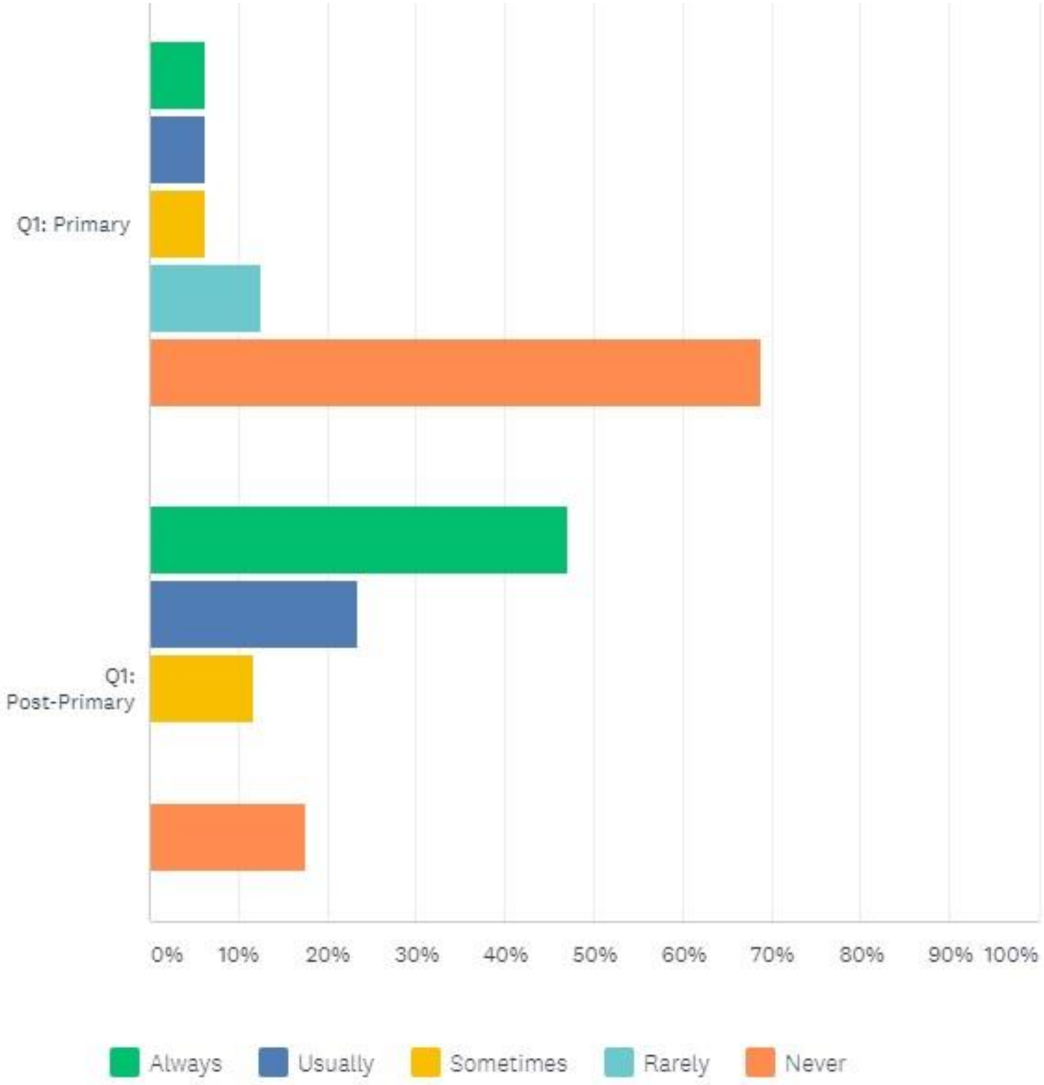

Figure 3.13: Bar chart with responses to primary and post-primary teachers to "I collaborate with post-primary school teachers to gain insight into aspects of teaching and learning of mathematics at post-primary school level".

In responses to this question, 47% of post-primary teachers and six% of primary teachers answered "Always", 24% of post-primary teachers and six% of primary teachers answered "Usually", while 12% of post-primary teachers and six% of primary teachers answered "Sometimes". 13% of primary teachers answered "Rarely" and 18% of post-primary teachers and 69% primary teachers answered "Never".

Most of the post-primary teachers (94%) reported either “Rarely” or “Never” when asked about collaborating with primary school teachers to gain insight into mathematics taught at primary level. In a similar vein, a high proportion of primary school teachers (81%) answered either “Rarely” or “Never” when asked about collaborating with post-primary school teachers to gain insight into mathematics taught at post-primary level. It is evident that there are little cooperative practices between teachers at both levels, despite the multitude of studies that outline probable benefits. Collaboration between teachers can improve efficacy in practices and increase positivity towards teaching and learning. Good practices could therefore be transferred to teachers at both levels (Goddard *et al*. 2007; Smyth *et al.* 2004). Interestingly, 20% of primary school teachers chose “Never” when responding to the question regarding collaboration with primary teachers. Similarly, 18% of post-primary teachers also chose “Never” when responding to the question regarding collaboration with post-primary teachers. It appears that post-primary teachers do collaborate with other post-primary teachers slightly more often than primary school teachers do with other primary school teachers. Yet, many appear not to do so too often, indicating that there is little internal collaboration between teachers in their own schools. Perhaps the lack of internal collaboration at primary level is due to minute staffing. Irish primary schools tend to have smaller student numbers in comparison to secondary schools, meaning that there are less teachers. There may not be more than one teacher for each year group, making collaboration seem unnecessary. Conversely, post-primary schools have a larger teaching staff. Usually mathematics, for example, is taught to many year groups and there may be many colleagues within one department, thus an ease of collaboration is created, due to more educational commonalities.

Additionally, collaboration between teaching staff at both levels could therefore help inform each other of contextualised issues that general educational policy documents may fail to do. The contexts of the feeder primary schools and new secondary schools could be experienced and better understood if communication networking was facilitated. Certainly, teachers can follow curricula at both levels to help ease the transition of mathematics, yet it is important to recognise that guidelines may not always be idyllic in practice. Barrow (2015) argues that while curricula can be very practical, some fail to assimilate theoretical backbones, and vice-versa. However, the scheduling of collaboration between primary and post-primary teachers may be questionable, considering the schooling demands that are in place throughout the academic year already.

It is important to note that during data analysis, the researcher recognised that the wording of Question Twelve and Thirteen may have been misinterpreted. Teachers may not have understood if the collaboration was meant internally or externally, which may have affected these findings, resulting in a negative response to collaborative practices. An additional and more specific question could have eliminated this issue.

Q14. Does your school facilitate any programmes/events that aim to ease the transition from primary to post-primary school?

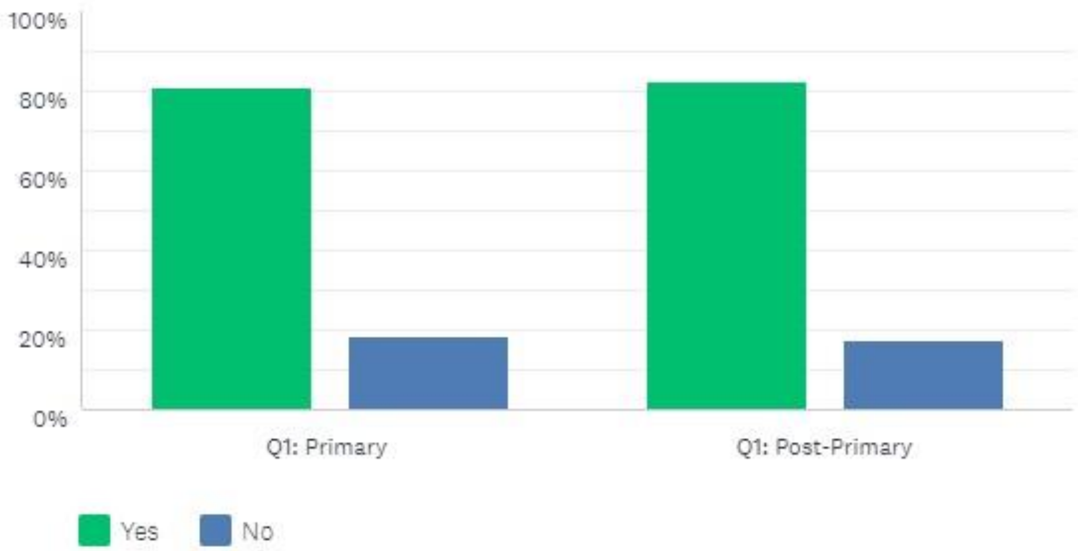

Figure 3.14: Breakdown of responses to "Does your school facilitate any programmes/events that aim to ease the transition from primary to post-primary school?".

In response to this question', 82% of the post-primary teachers answered "Yes" and 19% answered "No". Similarly, 81% of primary teachers answered "Yes" and 18% answered "No".

Note: Findings for Question Fourteen will be discussed collectively with assertions from Question Fifteen.

Q15. If you answered "Yes" to question 14, please provide details of such programmes/events. If you answered "No", please type "N/A".

In response to this question, 21% referred to a transition programme that the school provides for sixth class students. One programme that was mentioned repeatedly included the "Meitheal Leadership Programme". Meitheal is an old Irish term which describes the unity of neighbours when assisting each other in tasks (Tusla 2015). In the context of educational transition, the needs of sixth class students are prioritised by schools by putting a mentor programme in place. Senior second level students are designated mentees from the transitioning groups of students. This 'Meitheal Group' of mentors are a support system and aim to help with induction and integration (Scoil Chríost Rí 2018). Other strategies mentioned previously in Section Two seem to tie in with the findings of this question also, as "Transfer days" and "Open days" were events reported by 40% of participants where primary students get an opportunity to familiarise themselves with the new post-primary building, teaching staff and subjects. It seems that most schools are acknowledging the need for such measures to improve communication among children, teachers and parents as evident from the research findings and this reinforces finding from the transitional study by Graham and Hill in 2003. 12% of participants' responses reported that either post-primary staff or students visits primary schools to inform primary school children about the secondary school environment. This also correlates with Zeedyk *et al*.'s (2003) suggestion that past pupils should return to their primary school to share their experiences. This could help alleviate possible anxiety among the sixth-class students if the past pupils were assuring and affirmative about their initial experiences at post-primary level.

Six% of teachers mentioned the "Education Passport" system. This is a document containing students educational reports obtained during primary school. Once a child enrols in second level, the passport is forwarded to their chosen post-primary school (NCCA 2015). It is envisaged that such documents will help inform teaching and accommodate learning for students once they begin post-primary school. From the 2014/2015 academic year, the use of Education Passports has been mandatory (Ireland, DES 2014). Yet a significantly low number of participants indicated that it was a practice employed by their school.

Evidently there many practices in place as many schools recognise the need for such programmes to scaffold perhaps the most difficult changes in a pupil's educational career (Zeedyk *et al*. 2003). Still, 18% of teachers either answered "N/A" or skipped the question completely. Yet, it is possible that a contributing factor to this percentage could be the ignorance of teachers to programmes that are in effect. However, it is also quite feasible to conclude that perhaps the schools of these teachers do not facilitate any programmes to help ease the transition phase.

Furthermore, it appears that many of the programmes dealt with improving the social aspects incurred, i.e. the ‘hidden curriculum’ during the transition, such as the mentor programmes and familiarisation days. Only three% of teachers alluded to the sharing of curricula principles for the transfer process. Of that small number, one teacher reported that the following occurs; ‘A meeting happens between first year mathematics teachers and primary school principals to gain an understanding of what they covered and to what level in 4^{th},5^{th} and 6^{th} class’. This conveys that some collaboration between staff at both levels occurs and the acknowledgement of prior knowledge and acquisition of future learning exists. Unfortunately, in this case, it was only reported from a minority of teachers.

3.10.2 Data analysis of Lesson Observations

Class Group	Student Number/Gender Breakdown	Classroom Set-up	Curricula Strands/Topics	Teaching Methodologies Employed	Student Participation	Resources Used
Primary: Fifth And Sixth Class	30 students: Fifth:11 students; 6 girls, 5 boys (Mixed Ability) Sixth:19students; 9 girls, 10 boys (Mixed Ability)	Desks were positioned in horizontal rows, with two students sitting at one desk, facing towards the whiteboard. Fifth class were placed on one side of the room and sixth class were on the other. Mathematical posters and resources were evident.	*Fifth and Sixth Primary Mathematics* Measure: Length and Area	Questioning, Class discussion, Praise, Set Induction and Closure, Use of ICT, Real-life applications, Student-centred learning, Differentiation, Group work	Engaged, Curious, Active, Talking, Walking around the classroom, Story telling	Textbooks, Interactive Whiteboard, Stationary Rulers, Metre Stick, Trundle Wheel.
Postprimary: First Year	22 students: 11 girls, 11 boys (Mixed Ability)	Desks were positioned in squares with 5 or 6 students sitting around each square. Mathematical posters and resources were evident.	*Junior Certificate Common Introductory Course (CIC)* Strand 3; Geometry and Trigonometry; Introduction to Coordinate Geometry of the Line	Set Induction and Closure, Questioning, Group work, Use of ICT, Real-life applications, Differentiation, Praise Teacher-Talk, Demonstration of Exam Skills	Engaged, Active, Peer assessing, Talking, Questioning	Games, Whiteboard, Text books, PowerPoint, Internet, Rulers, Calculators, Stationary.
Postprimary: Second Year	12 students: 5 girls, 7 boys (Streamed: Ordinary Level)	Desks were positioned in horizontal rows, with two students sitting at one desk, facing towards the whiteboard. No evidence of mathematical posters and resources in the room.	*Junior Certificate Common Introductory Course (CIC)* Strand 4: Algebra: Simultaneous Equations with two unknown variables.	Set Induction and Closure, Questioning, Use of ICT, Traffic Lights for Feedback, Differentiation, Groupwork, Demonstration of Exam Skills	Relatively engaged, Curious about real-life applications, Group work, Use of ICT	Handout, Whiteboard, Mini Whiteboards, Internet, Calculators, Rulers, Stationary.

Table 3.3: Table of findings from lesson observations at both primary and post primary level.

Findings from the lesson observations at primary and post-primary level are ordered in categories (Table 3.3) and will be discussed collectively. Individualistic approaches, common themes and comparisons will be highlighted throughout. It is important to note that the primary school observation consisted of a multi-grade class, where fifth and sixth students were taught the same topic by one teacher at the same time, within one classroom.

Lesson Observations: Student Number and Gender Breakdown

There was a considerable difference between the student number of all three classes, particularly in the multi-class environment, where the learning of mathematics had to be facilitated to both fifth and sixth classes. The necessity to react to the varied student interest and ability within a multi-grade classroom can be quite challenging (UNESCO 2015).

The combination of the classes brought the total students to thirty which was slightly larger than the other two class sizes. Often, focus is placed on the need for smaller class sizes, however it appears that it minutely influences student progress (Coe 2013). Evidently, the primary school teacher had more student needs to attend to than the other two post-primary teachers, yet, class sizes did not appear to have an obvious impact on teaching and learning nor did it make a comparable difference to lesson delivery.

There seemed to be little to no significant differences between student attainment by males and females at both levels, despite the societal assumption that men are stronger performers at mathematics and science than women (Nosek and Mahzarin 2002). Boys and girls at both levels appeared to attempt tasks posed with equal enthusiasm and effort.

The multi-grade primary school class and the first-year post-primary class were both of mixed ability, whereas the second-year post-primary class was a streamed ‘ordinary’ level mathematics class.

Lesson Observations: Classroom Set-up

The seating arrangements of the multi-grade primary school classroom and the second-year post-primary classroom were of a similar nature. Individual desks were lined in horizontal rows facing the whiteboard and teachers desk, with two students sitting together at one desk. In contrast, desks were positioned in squares with five or six students sitting around each square in the first-year post-primary classroom. It is recommended that seating arrangements should be adapted to facilitate meaningful social interactions (Ireland, DES 2015). In addition, both primary and post-primary curricula greatly emphasize the need for mathematical communication and expression of ideas. Petty (2009) consolidates the importance of seating plans as it enables eye-contact and face-to-face communication. If seating is arranged to suit purposes, then attention to detail can be greatly increased. This was evident in the first-year post-primary classroom setting. Once the students were set a group task, discussion occurred with ease, much more than with the students in the second-year group, who were not facing each other. Both first and second year students did participate in the group tasks, yet communication between the first-year students seemed to flow much easier. With that said, the horizontal desk positions did not significantly affect student discussion in the primary school environment. Students were active by walking around their desks and talking to not only the students beside them but others sitting elsewhere. Traditionally research has found that seating rows are more conducive for students' attention in class, but such a design is preferable for teacher centred lessons. Radial seating around tables is much more suited for co-operative learning (Blatchford *et al*. 2003).

Mathematical posters and student work were displayed in the primary and post-primary first year classroom, however there was no evidence of such materials in the second-year classroom. Posters can add uniqueness to classroom settings, activate student attention, catalyse cognition and construct knowledge (Hubenthal *et al*. 2011). Furthermore, Trussell (2008) describe displaying student work as being a classroom universal in preventing problematic behaviours, because in doing so, the teacher creates a positive learning environment with the public acknowledgement of student effort. Therefore, this practice effectively adheres to curricula aims at both levels, where positive attitudes should be fostered towards mathematics (NCCA 2016). Trussell also outlines the limitations of secondary school environments in facilitating the exhibition of student work because of the high number of students that present to classrooms daily. This may possibly explain the absence of posters and student work in the post-primary second-year mathematics classroom. It is important to note that this classroom was primarily used for teaching history lessons and the mathematics teacher in question did not have their own classroom.

Lesson Observations: Teaching Methodologies Employed

Interestingly, teaching methodologies at both levels had more similarities than differences. Set Induction and Closure prevailed in all lessons, which predominantly involved sharing the learning intentions and content sequence, reactivating prior knowledge and then summarising content taught towards the end of the lesson (Dallot 2013). Such practices increase student focus, motivation and heighten responsibility of learning (NCCA 2015). The lesson intentions were written in a section of the whiteboards and remained there throughout the lesson in the post-primary first and second year lessons. In a less formal manner, they were verbally stated in the primary school lesson. Also, prior knowledge was reactivated through questioning and discussions involving a recall of what was learned previously. It was also revisited by some questioning in the post-primary lessons, but more so when correcting homework questions.

There was a high use of questioning used in all three lessons, involving higher and lower order thinking. One noticeable difference was that in the post-primary first year and second year classes, students had to raise their hand to answer questions, whereas the primary school students just answered freely and often their answers led to a group discussion about the lesson content, without structure. In the primary and first-year classrooms, feedback related to understanding was mostly obtained through answering and reviewing work completed. The second-year teacher implemented a 'traffic light' method, which involved students raising a piece of paper with either green, amber or red on it, depending on the level of learning achieved. Green signalled that they understood exceptionally well, 'Orange' signalled there was moderate understanding, and 'Red' signalled further clarification was needed (Young 2018). Student feedback in all cases guided the subsequent teaching of the lessons.

Group work was implemented in all three lessons, students were encouraged to work together after tasks were assigned. All students collaborated in a natural manner, with little instruction, inferring that co-operative learning occurs frequently. This too is a strong aim of both curricula, where it is envisaged that primary school students communicate and logistically express mathematical ideas orally and in written form (Ireland, DES 1999; NCCA 2016)

Real-life applications and problem-solving tasks were assigned in the lessons. In the primary lesson, students had to measure their desk with a ruler, in the post-primary first-year lesson, students played 'battleships' using co-ordinate geometry and the point of intersection of two train tracks had to be found using algebra in the second-year lesson. Reiterating information from the questionnaire analysis, mathematical problems should have meaningful contexts that relate to student attentiveness to heighten student interest (Petty 2009). However, 'meaningful tasks' at second level appeared to be double-edged, in that they included aspects of real-life application, yet strong assessment focus was emphasized too. Certainly, student relevance was incorporated in lesson design, but there was also a great urgency placed on the demonstration of exam skills. Sentences such as "you must show all workings", "always include units of measurements", followed by statements related to repercussions in exam performance, if such advice was not followed. Alluding to Popham's (2001) argument again, it was evident, that teachers were 'teaching to the test' to some degree. Conversely, there was no reference made to any summative assessment procedures in the primary lesson.

Teaching observations in the two settings primarily involved SCL. The primary lesson was almost entirely student led and 'teacher-talk' was minimal and typically interactive. At postprimary level, the first ten minutes of each lesson involved 'teacher-centred' learning, where both teachers corrected the homework task from the lesson previously. Indeed, there were questioning, yet the demonstration of the mathematics processes was completed wholly by the teachers. However, once homework was corrected, SCL practices were implemented for the remainder of the lessons. It is important to note that the primary school lesson involved the introduction of a new section and it seemed that a homework task was not set from the lesson previously. Both post-primary lessons involved a continuation of a topic that had formerly been taught. Perhaps the lesson opening of the primary lesson could have had a similar introduction if this too was the case.

There were no significant differences between the nature of the classwork tasks set by the teachers in all the observations. Students either used problems from their textbooks, answered questions and competed in real-life activities with peers. Although, there were significant differences between the homework tasks. Homework from the primary teacher incorporated further real-life application of the content covered as students had to measure the length of their bed. Both post-primary teachers set homework tasks either from their text book or exam questions involving relatable problems to the content covered in class. Both the Primary School and Junior Certificate mathematics curricula place strong emphasis on the need for real-life application of mathematics during teaching and learning. Teachers are encouraged to provide a facility for the application of mathematics to real contexts to develop mathematical skills needed for life. (Ireland, DES 1999; NCCA 2016). It cannot be argued that real-life applications were omitted in all three lessons, however, it seemed that the post-primary teaching returned to a didactic, almost traditional, approach when assigning homework. As outlined in Section Two, both curricula have similar aims, despite the difference in assessment processes. The process of achieving mathematical learning for exam situations are referred to in the aims of the Junior Certificate syllabus, yet exam skills are not explicitly outlined. Quite frequently, post-primary teachers seemed to refer to exam skills and material. The limitation of such practices is that this involves a spectrum of instructional tasks to complete an assessment, rather than the development of the skills that can be applied elsewhere (Jennings and Bearack 2014). Therefore, this almost contradicts the objectives set out by any mathematics curriculum. However, teachers can often feel a sense of accountability for student attainment in 'high-stake exams' (Coe 2013). Again, reiterating literature findings examined in Section Two, results can place blame on teaching practices and therefore influence classroom decisions (Remesal 2011). It is important to acknowledge that post-primary school teachers are currently pressurized to achieve curricula demands due to time constraints (Shiel and Kelleher 2017). These factors may be contributing to such instructional practices observed in the post-primary settings.

Finally, positivity towards teaching and learning was demonstrated from all teachers during lesson observations. In addition, effective differentiation practices were in effect, such as structured problem solving, where answers to problems provided an opportunity for all learners to achieve. Adequate praise and acknowledgement were in effect, thus a positive disposition towards mathematics was fostered, as recommended by the NCCA (2016). *Lesson Observations: Student Participation*

Students were all relatively engaged in the lessons observed. One stark difference however was that the students in the primary lesson were able to walk around the classroom during the lesson. Also, there was a constant level of talking and storytelling among students. In contrast, the post-primary students remained seated throughout the lessons and only spoke when tasks were set or if answering questions. Alluding to Smyth *et al*.'s study in 2004 yet again, who found that generally post-primary schools are held to be characterised by a culture of control and a greater level of formality, more than what senior primary students may be accustomed to. This echoes with this difference in student participation at both levels. Yet, it is also important to acknowledge the dependency levels of the students in question. Naturally students at primary school are generally less mature than students at post-primary level. Perhaps teacher-student interactions are not necessarily required as much at second level. During adolescence, teenagers can seek to gain independence from adults, yet by the same token, they still seek a certain degree of appropriate dependence in the short-term before reaching longterm independence (Szwedo *et al*. 2017).

Although all were engaged, some of the students in the post-primary second-year lesson seemed a little less enthusiastic than the students in the primary and first-year lessons. One student also questioned the necessity of covering the topic by asking "When will we ever use this again?"

in the introductory stages of the lesson. As mentioned previously, Sparrow (2008) states that mathematics students often question the validity of studying areas within mathematics. This issue was clarified in the latter stages of the lesson when real-life applications were presented. The slight level of disengagement in comparison to the primary and first year lesson could correlate to findings related to streaming classes according to ability. The post-primary second-year group was the only one that was banded according to ability. Findings from Hallam and Parsons's study in 2003, as outlined in Section Two, favoured mainstream set-ups as student participation can be greater. Streaming can also negatively impact on student attainment (Francis *et al*. 2016). Furthermore, as evident from literature Section Two, many dramatic changes occur in adolescence around the age of fourteen and fifteen which is the typical age of a second-year student (O'Brien 2006). Such aspects could be possible contributing factors to the disengagement of students, as this was a lower streamed class.

Lesson Observations: Resources Used

All three lessons utilised a variety of resources to facilitate learning. ICT was used by all teachers. The primary school teacher used an interactive whiteboard which had a variety of mathematics applications. Microsoft PowerPoint was used by both the post-primary first-year and second-year teachers. The second-year students were also provided with portable tablet devices to carry out a task online. All three classrooms had a vast amount of relevant resources within the classroom and were accessed with ease, showing that curricula guidelines regarding the importance of resource use at both levels were adhered to. One prominent difference, however, was related to calculator use. All students at post-primary level used calculators when no students at primary level used a calculator. 'An understanding of the structure of number can be enhanced by the exploration of patterns, sequences and relationships with a calculator' (Ireland, DES 1999, p.7). Both curricula encourage the use of calculators in mathematics. At primary level, students are permitted to use them from fourth class onwards and they can be used throughout the duration of secondary school. However, one could argue that students may be over reliant on calculators. In an age of technological advances, most teachers believe that calculators are tools for moving forward in the future, but moreover, if overused, they could hamper the development of basic numeracy skills (Salani 2013). Perhaps this point could be considered when reviewing student progress at post-primary level.

3.10.3 Overlap of Findings from Questionnaires and Observations

As outlined in Section 3.9, a sequential exploration strategy was employed in this study to provide a triangulation of results, thus improving their reliability and validity. The overlap consisted mainly of commonalities in teaching methodologies and resource use, rather than teachers' perceptions of the transitionary phases, or references to current practices in place to ease the transition period.

A variety of AfL findings were evident from both data sets. This included peer work, student communication for problem-solving and real-life context and application. Positive attitudes appeared to be enabled at both levels from the lesson observations, still, the questionnaire found a relatively higher response from primary teachers regarding the fostering of positivity when facilitating mathematics. SCL approaches were used in all three lessons but more so in the primary lesson. This correlates with the findings of the questionnaire, as SCL was reported to be more commonly used by primary teachers by 10 percent. This finding also relates to Smyth *et al*.'s study in 2004, where post-primary teaching was found to employ more rigid teachercentred methodologies, than those at primary level.

A myriad of resources were employed in all three lesson observations, however, there were undisputable differences in the amount of resources listed in the primary teachers' responses of the questionnaire. It appears primary teachers use considerably more resources when teaching mathematics. Also, the majority of resources used at second level could be considered as being exam materials. Calculators were used by all post-primary students and not by any primary students in the lessons observed. In addition, only one primary teacher reported that calculators were used in their response regarding resource use in the questionnaire. Calculators use is permitted by both curricula. Yet it appears it is used more at post-primary level. Although favoured by most teachers, overreliance may negatively affect basic numeracy skills, as outlined previously by Salani (2003), which in turn could possibly affect student attainment at post-primary level, after the transition phase.

3.11 Chapter Summary

This chapter discussed and justified the methodologies employed. Alternative approaches were also considered yet the advantages of the questionnaire and lesson observations outweighed the benefits of the other possible methodologies. The ethical process was described, and procedures implemented to improve reliability and validity were also identified. Data analysis and discussions then followed.

The following chapter summarises the data analysis, when findings from the questionnaire, lesson observations and existing literature will be weaved together.

SECTION FOUR – CONCLUSIONS

4.1 Introduction

This final section highlights the main findings from the data analysis. Links to other existing research findings are made and new assertions are discussed. Further recommendations for future research are outlined. In addition, existing and supplementary limitations of the study are examined.

4.2 Conclusions

4.2.1 Evaluation of The Delivery of Curricula

Teaching and learning approaches at both levels seem to have many parallels. It appears that constructive approaches that demonstrate real-life application are implemented. A multitude of AfL methodologies seem to occur also. These findings suggest that a degree of curricular continuity occurs, which in turn, encourages a relative amount of similar teaching methodologies.

One major difference however, was related to resource use. The primary teachers listed almost 50% more resources than the post-primary teachers. Many of the resources outlined by postprimary teachers were also exam materials. Calculator use was almost non-existent at primary level, yet it seemed to be an integral part of teaching and learning at post-primary level. Alluding to findings in Section Three again, perhaps the overreliance of such technology affects students' basic numeracy skills, that were once developed in primary school.

Primary school teaching has been criticised for not adequately preparing students for postprimary level mathematics (Shiel and Kelleher 2017). However, data findings in this study did not resonate with this assertion. SCL is incorporated at both levels but arguably more at primary level. Teaching to 'high-stake' exams could be an affective factor leading to teacher-led lessons at post-primary level instead. Like findings from Smyth et al.'s study in 2004, summative assessment practices appear to guide learning.

Findings related to teacher collaboration practices within school organisations appeared to be relatively low across both levels, particularly at primary level. The omission of such professional practices would suggest that there is a curriculum discontinuity, where good practice is not in effect at both levels, which was a possible issue affecting transition outlined by Galton et *al* (1999) in Section Two.

Finally, as Francis et *al.* (2016) outlines, streamed classes appear to be problematic. The students were most disengaged in the only streamed class of the lesson observations. Streaming is a common and unique practice to post-primary level, making it a significantly varied practice from classroom settings at primary school. If placed in lower ability bands, such as “ordinary” level classes, student confidence and motivation may diminish, which could adversely hamper progression.

4.2.2 Teachers’ Perceptions of Transition Phases and Transitional Practices in Place

Teachers’ perceptions and knowledge about the transitionary phase varied. There was a high incidence of teachers who reported that they adapted methodologies to ease transition phases, suggesting that teachers recognise the need to do so. Yet, this was almost contradicted by other responses in the questionnaires, where many primary and post-primary teachers reported that they do not consult the alternate curriculum. Additionally, only a minority stated that they collaborated with teachers at levels different to their own. An assumption would be that teachers would have to either address the curricula or co-operate with teachers from different levels in order to gain insight into the different practices. Collaboration would ease the processes of reactivating prior knowledge and guiding future learning. Such two factors, as previously outlined by Dallot (2003), are imperative for successful learning. Collaboration with teachers from other levels would also provide information about schooling contexts, which are generally omitted from curricula and educational policy documents. ‘One size does not fit all’ in school settings, therefore communication from relevant teachers across both levels would offer additional information, thus creating a clearer picture of past and future learning environments. The recognition of context in education is beneficial for learning as it facilitates the needs of students and teachers alike (Taconis *et al*. 2016).

Many practices were in place to ease the transition process, showing that primary and postprimary schools do acknowledge the need to scaffold the move to alleviate possible challenges (Galton *et al.* 1999). It could be argued, however, that many of these practices do not address the formal curricula of mathematics. Instead they focus on social issues that students may encounter during the transition, as part of the ‘hidden curriculum’ in schooling. Additionally, there appeared to be a lack of consistency in responses. Some reported that no transitional practices are in place, even though there are mandatory programmes such as the “education passport” system. Perhaps not all teachers were aware of the practices that are in place or that should be facilitated. In addition, there were very little programmes in effect that were related specifically to the mathematical transition.

4.3 Limitations of the Study

As outlined in Section One, the study was small scale in nature which means low variability was yielded. It could be argued that findings represented one specific point in time. It was not a longitude study that collected at least two sets of data over an extended period to provide comparative data (Connelly 2016). Timing was limited which may have impacted on the data collection process. In addition, some data collection took place in the researcher's work place which could have led to possible bias, despite the strict reliability and validity procedures that existed. One question of the questionnaire, regarding collaboration, may have also been misinterpreted, as outlined in Section Three.

As mentioned previously, there seemed to be an ignorance among teachers regarding the transitional practices in place in their school. Therefore, questionnaires could have been distributed to principals also. It is probable that they are more aware of such programmes and perhaps issues relating to transition. Furthermore, it would have been extremely beneficial to have surveyed students to find out about their experiences and attitudes towards mathematics before and after the transition. However, again, the time frame of the study did not permit such practices, particularly in relation to ethical procedures.

As mentioned in Section One, this study took place during a time were curricula reform at both levels was in effect. It is important to acknowledge the educational practices that were in place during the research recruitment stage. Perhaps some of the factors that currently impede transition may be addressed in the new primary and post-primary mathematics syllabi that will be published in the coming years.

4.4 Future Recommendations

Based on the findings from Section Three, many recommendations were identified.

Curricula at both levels should obtain specific guidelines to help teachers facilitate the transition easier. Also, as Smyth et al. (2004) outlined, training should be provided to teachers at both levels for guidance and perhaps to recognise commonalities between curricula.

Internal and external collaboration among teachers at both levels should occur more frequently. Time should be allocated during the school year to permit such professional practice, whether it occurs inside or outside of school.

The effects of calculator use on mathematical progression could be investigated. It appears to be a prominent resource used at post-primary and not as much in primary school. This obvious difference may be a contributing factor to the regression of student attainment. Additionally, a wider range of mathematical resources should be provided to post-primary schools. The provision of resources to primary schools seemed significantly higher and many resources used at post-primary were mainly exam materials.

Post-primary teachers should acknowledge the necessity of teaching mathematics to develop numeracy skills that are applicable in everyday situations as opposed to exam skills only. Teaching to the test is not conducive for effective teaching and learning.

Further studies relating to the transitional phases may consider other experiences of key personnel, such as principals or students. This would provide a greater insight into the practices and attitudes towards the process. Longitude studies would be also more feasible. In addition, a study investigating the transition and its effects on mathematics after the introduction of the new curricula at primary and post-primary would be interesting. Particularly if some of the issues found in this study no longer prevailed.

Finally, this study investigated current teaching methodologies, teachers' perceptions and transitional practices in place. Nevertheless, inefficiencies in schooling policies and procedures were highlighted. Transitional practices are predominantly decided upon by principals. Indeed, teachers can contribute with suggestions and ideas, but the gatekeeper and Board of Managements have the final say on the implementation of practices. More consistent transitional programmes must be in place to help scaffold the learning of mathematics. Furthermore, streaming practices should really be evaluated and reconsidered as it appears to negatively impact student attainment.

4.5 Concluding Remarks

This study provides many valuable assertions about the effects of the mathematical transition in County Donegal. Although small scale, there were still many overlaps in findings with existing relevant research, which contained larger sample sizes and longer research recruitment periods. Therefore, with limitations considered, it is envisaged that some findings from this study could be generalised, thus contributing to such existing literature and perhaps guiding schooling practices when faciliating future mathematical transitions.

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Appendices

Appendix A

Research Time Schedule

Appendix A

Research Time Schedule

Years 2017 - 2018	Tasks Completed
September – January	• Research Focus Outline • Ethics Application submitted and Approved • Research Proposal including Literature Review, Methodology
February - March	• Lesson Observations at primary and post-primary settings
April – May	• Questionnaire made available online Emails sent to relevant principal
June – August	• Data analysis of both lesson observations and questionnaire findings • Discussion, Conclusions and Recommendations completed

Time Horizon, adapted from Ferry (2016).

Appendix B

Research Information Sheet

(Principals)

Appendix B

Letterkenny Institute of Technology

INFORMATION SHEET

School Principals

Title: ‘The Continuum of Teaching and Learning of Mathematics from Primary to Post-Primary Level: Experiences and Beliefs of Teachers.

Who Am I?

My name is Lorraine Cunningham, I am a student undertaking the MA in Learning and Teaching programme at LYIT. I am also a post-primary school teacher of Mathematics and Geography at XXXX

What is the Research About?

The transition from primary to post-primary school has been depicted as one of the most difficult in a pupil’s educational career. The move from the smaller, more personal environment of the primary school classroom to the larger impersonal world of the secondary school requires significant adjustment. Literature suggests that a “smooth transition” between educational contexts is of paramount importance as frequently unsuccessful change can result in students encountering difficulties with educational attainment at post-primary level. Environmental issues, such as larger buildings and older peers, to name a few, will more than likely be an issue, regardless of the context or geographical setting. Yet a continuum of learning approaches among teachers and relationship between curricula at both levels are factors that can be controlled to aid more successful transitions.

Mathematics at primary school level encourages a ‘constructivist approach’ to the subject, where students are active participants in the learning process and acquired information is interpreted by the learners themselves, from junior ages continually to the senior years. Assessment is, for the most part, formative. Students are assessed in standardised testing, however, this is not specifically assessing progress in mathematics as a subject, instead, although relevant, such examinations focus on literacy and numeracy levels.

Generally, second level students can engage with five academic years of studying mathematics and are assessed both formatively and on a summative basis. Students frequently sit ‘end of chapter’ exams and subsequently the state examinations, as part of the Junior and Leaving Certificate courses. Unlike the primary school curriculum, the syllabi at both Junior and Leaving Certificates do not explicitly refer wholly to constructivist approaches, instead it aims to promote effective problemsolving strategies. Such approaches however do have active learning methodologies intertwined. A report published by the National Foundation for Education (NFER) in 2013 evaluated the introduction of the Project Mathematics course at second level. Although sample sizes were small, their assertions should certainly be considered when facilitating mathematics. It was found that students are relatively positive about their transition from primary to post-primary school as they felt they experienced a level of continuity in course content at Junior Certificate level. However, teaching approaches were described as "traditional", where content was emphasised, as opposed to highlighting the processes that should be promoted within it. Constructivist methodologies failed to be primarily employed at second level thus showing a disjoint across teaching and learning approaches.

The focus of this research proposal is to;

a. Evaluate the delivery of curricula content across a local primary and secondary school setting, comparing teaching methodologies, noting common and/or differences in teaching approaches when facilitating the learning of mathematics.

b. Investigate teachers' perceptions and knowledge of the transitionary phase.

c. Determine if any practices are in place to help with the change from senior level primary mathematics to Junior Certificate mathematics at post-primary level.

The educational settings studied will be a primary school and secondary school in XXXX Co. Donegal. Previously, almost 100% of students who attend the primary school subsequently enrol to the secondary school in question.

Why Am I Doing the Research?

There has been very little research carried out in subject specific transition phases and the impact of this process on teaching and learning. Most literature refers to the effects of the transition from primary to post-primary in relation to students with Special Educational Needs.
Furthermore, information obtained may not only be relevant to mathematics, but it could also be applicable to other subject areas that are continued from primary to second level in this local context and perhaps on a broader scale of educational transition.

How Will I Do the Research?

This study will involve a wholly qualitative methodology, consisting of questionnaires and classroom based observations.

Questionnaires will be distributed to both primary and post-primary school teachers who teach either senior level students at primary school or first year students at second level.

The gatekeeper will be provided with a link to the online questionnaire via email. If permission is given, the gatekeeper can forward this email to teachers. An outline of the research purpose and consent information will also be attached. I will permit an appropriate time frame for responses, if teachers would like to participate. Consent is assumed by teachers if they click onto the link and complete the questionnaire, 'Survey Monkey' will be used to facilitate the completion of the questionnaires.

The **classroom based observations** will take place in one primary school and one post-primary school within the catchment area. The observation will provide an opportunity to compare teaching methodologies when facilitating the learning of mathematics in this context. Interactions between the researcher and students will not be occurring at any stage throughout the observations. It is also important to note that this is not an assessment nor an inspection of teaching and learning.

Rights

Permission for teachers to be involved in this research will be sought from both the Principals and the teachers themselves. There will be no penalty encountered if either the teacher or Principals withdraw from the study. Participants may withdraw from the study up to the point of return of their completed questionnaire. Principals may withdraw their consent up to the point of data analysis (late April 2018).

The data generated by this study will be used in my dissertation for a Masters of Arts in Learning and Teaching, and may also be used in academic papers, journal articles and in future research studies. Teachers' names will not be used in the dissertation, reports, articles or presentations emerging from this research. If you would like to obtain more information about the study, then please contact me via the details given below.

All material/data collected, will be kept securely on the researcher's laptop (password protected). All collected data will be stored in the School of Business, LYIT for five years after the completion of the research then it will be destroyed securely.

Further Details

For more information please contact me at: E-mail: XXXX

Appendix C

Research

Consent Form

(Principals)

Appendix C

Letterkenny Institute of Technology

CONSENT FORM - PRINCIPALS

Title: **Title of Project:** 'The Continuum of Teaching and Learning of Mathematics from Primary to Post-Primary Level: Experiences and Beliefs of Associated Teachers'.

This study aims to discover the experiences and opinions of both primary and secondary school teachers in their classroom environment. It has been noted that student progress regresses once joining secondary school. I would like to investigate the difference (if any) in the facilitation of learning at both levels and if such varied teaching methodologies may impact on student attainment and experience

Participation in the research is entirely voluntary and teachers' and student involvement will only be allowed with your agreement. Teachers' consent will also be required. There will be no interaction between the researcher and student at any time.

Non-participation in the study will have no adverse impact on any of your future contact with myself, the School of Business or staff involved in the MALT programme at LYIT.

Please tick:

I have read the information sheet which explains the research study [ ]

I understand that all the information that students give will be kept strictly confidential and that students' name(s) will not be asked for, nor included in any reports [ ]

I understand that participation of teachers within my organisation is voluntary and that I am free to withdraw my consent up to the point of data analysis (late April 2018) [ ]

I understand that this research will be published as a dissertation and possibly in academic journals. The research may also be presented at conferences and seminars [ ]

Please sign below.

School name (in CAPITALS): ________________________________ **Your name (in CAPITALS):** __________________________________ **Signature of Principal:** ________________________________

Date: ______________

Please return this form to Lorraine Cunningham by 15th of January. Thank you.

Appendix D

Research Information Sheet;

Lesson Observation

(Teachers)

Appendix D

Letterkenny Institute of Technology

PARTICIPANT INFORMATION – LESSON OBSERVATION

Title: 'The Continuum of Teaching and Learning of Mathematics from Primary to Post-Primary Level: Experiences and Beliefs of Teachers'.

Name of Researcher: Lorraine Cunningham

Introduction and aims:

The transition from primary to post-primary school has been depicted as one of the most difficult in a pupil's educational career. The move from the smaller, more personal environment of the primary school classroom to the larger impersonal world of the secondary school requires significant adjustment. Literature suggests that a "smooth transition" between educational contexts is of paramount importance as frequently unsuccessful change can result in students encountering difficulties with educational attainment at post-primary level. Environmental issues, such as larger buildings and older peers, to name a few, will more than likely be an issue, regardless of the context or geographical setting. Yet a continuum of learning approaches among teachers and relationship between curricula at both levels are factors that can be controlled to aid more successful transitions.

Mathematics at primary school level encourages a 'constructivist approach' to the subject, where students are active participants in the learning process and acquired information is interpreted by the learners themselves, from junior ages continually to the senior years. Assessment is, for the most part, formative. Students are assessed in standardised testing, however, this is not specifically assessing progress in mathematics as a subject, instead, although relevant, such examinations focus on literacy and numeracy levels.

Generally, second level students can engage with five academic years of studying mathematics and are assessed both formatively and on a summative basis. Students frequently sit 'end of chapter' exams and subsequently the state examinations, as part of the Junior and Leaving Certificate courses. Unlike the primary school curriculum, the syllabi at both Junior and Leaving Certificates do not explicitly refer wholly to constructivist approaches, instead it aims to promote effective problemsolving strategies. Such approaches however do have active learning methodologies intertwined. A report published by the National Foundation for Education (NFER) in 2013 evaluated the introduction of the Project Mathematics course at second level. Although sample sizes were small, their assertions should certainly be considered when facilitating mathematics. It was found that students are relatively positive about their transition from primary to post-primary school as they felt they experienced a level of continuity in course content at Junior Certificate level. However, teaching approaches were described as "traditional", where content was emphasised, as opposed to highlighting the processes that should be promoted within it. Constructivist methodologies failed to be primarily employed at second level thus showing a disjoint across teaching and learning approaches.

The focus of this research proposal is to;

a. Evaluate the delivery of curricula content across a local primary and secondary school setting, comparing teaching methodologies, noting common and/or differences in teaching approaches when facilitating the learning of mathematics.

b. Investigate teachers' perceptions and knowledge of the transitionary phase.

c. Determine if any practices are in place to help with the change from senior level primary mathematics to Junior Certificate mathematics at post-primary level.

Procedures

An email outlining the research purpose and consent information will be forwarded to teachers, after initial permission granted by the school principal. I will permit a time frame for responses, if teachers would like to participate, they will have to decide within ten days. A box will left in the staffroom, where you can return completed consent forms by the 12th February 2018.

The observation is not an assessment nor is it an inspection. It will be used for research puposes and to gain insight into your experience of teaching mathematics at primary/post-primary level.

You will have the right to withdraw from the study until after the observation has taken place. Notes taken during the observation will be shown and you will then sign if there is an agreement in assertions found.

Confidentiality and data protection

Your identity will remain confidential, complete anonymity is guaranteed and notes taken during the observation will be shown to the teaching participant directly after the lesson. 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.

Voluntary Participation

You have volunteered to participate in this research project and signed a consent form. If you wish to withdraw from the project this may be achieved by not participating in the observation. There will be no penalty encountered if you do not choose to participate or withdraw from the project.

Discontinuation of the study

You understand that the researcher may discontinue the project at any time without your permission.

Permission

This project has Research Ethics Approval from LYIT.

Further Information

You may find more information about the research project or answers to any questions

or queries you may have by emailing XXXX

Appendix E

Research Consent Form;

Lesson Observation

(Teachers)

Appendix E

Letterkenny Institute of Technology

PARTICIPANT CONSENT FORM – LESSON OBSERVATION

Title: 'The Continuum of Teaching and Learning of Mathematics from Primary to Post-Primary Level: Experiences and Beliefs of Associated Learning Facilitators'.

Name of Researcher: Lorraine Cunningham

Declaration: I ____________________________________, acknowledge that:

- I have been informed of and understand the purposes of the study
- I have been given an opportunity to ask questions
- I understand I can withdraw up to the end of the observation until notes obtained are reviewed.
- I understand there will be no penalty encountered if I do withdraw from the study
- I understand that my participation is voluntary
- I consent to the publication of results
- I understand that my personal information will not be identified in this study and all data will be collected, processed, and stored securely
- I agree to participate in the study as outlined to me

Participant's Name: ____________________________________

Signature: ____________________________________

Date: __________________

Appendix F

Research Information Sheet;

Questionnaire

(Teachers)

Appendix F

Letterkenny Institute of Technology
PARTICIPANT INFORMATION – QUESTIONNAIRE

Title: 'The Continuum of Teaching and Learning of Mathematics from Primary to Post-Primary Level: Experiences and Beliefs of Associated Learning Facilitators'.

Name of Researcher: Lorraine Cunningham

Introduction and aims:

The transition from primary to post-primary school has been depicted as one of the most difficult in a pupil's educational career. The move from the smaller, more personal environment of the primary school classroom to the larger impersonal world of the secondary school requires significant adjustment. Literature suggests that a "smooth transition" between educational contexts is of paramount importance as frequently unsuccessful change can result in students encountering difficulties with educational attainment at post-primary level. Environmental issues, such as larger buildings and older peers, to name a few, will more than likely be an issue, regardless of the context or geographical setting. Yet a continuum of learning approaches among teachers and relationship between curricula at both levels are factors that can be controlled to aid more successful transitions.

Mathematics at primary school level encourages a 'constructivist approach' to the subject, where students are active participants in the learning process and acquired information is interpreted by the learners themselves, from junior ages continually to the senior years. Assessment is, for the most part, formative. Students are assessed in standardised testing, however, this is not specifically assessing progress in mathematics as a subject, instead, although relevant, such examinations focus on literacy and numeracy levels.

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b. Investigate teachers' perceptions and knowledge of the transitionary phase.

c. Determine if any practices are in place to help with the change from senior level primary mathematics to Junior Certificate mathematics at post-primary level.

Procedures

First of all, an email outlining the research purpose and consent information was sent to your principal. Your consent is assumed if you click on the link and complete the questionnaire in full. 'Survey Monkey' will be used to facilitate the completion of the questionnaires.
Please remember **not to include your name or your school's name** as responses must be anonymous. The questionnaire will be completed online only.

Exclusion from the project
The researcher has the right to remove any partially completed questionnaires.

Confidentiality and data protection
Your identity will remain confidential, complete anonymity is guaranteed and completed questionnaires shall not be returned directly to the researcher. 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.

Voluntary Participation

You have volunteered to participate in this research project and signed a consent form. If you wish to withdraw from the project this may be achieved by not submitting your completed questionnaire. There will be no penalty encountered if you do not choose to participate or withdraw from the project.

Discontinuation of the study

You understand that the researcher may discontinue the project at any time without your permission.

Permission

This project has Research Ethics Approval from LYIT.

Further Information

You may find more information about the research project or answers to any questions or queries you may have by emailing XXXX

Appendix G

Questionnaire
(Teachers)

Appendix G Questionnaire

Online Questionnaire using the Survey Monkey tool (www.surveymonkey.com)

1. What level do you currently teach at?

- ○ Primary
- ○ Post-Primary

Please choose the answer that applies most to the the teaching and learning methodologies used in your classroom in questions 2 to 8.

OK

2. Students learn from peers around them:

- ○ Always
- ○ Usually
- ○ Sometimes
- ○ Rarely
- ○ Never

3. Students communicate information to help solve practical problems:

- ○ Always
- ○ Usually
- ○ Sometimes
- ○ Rarely
- ○ Never

4. Positive attitudes towards mathematics are fostered in the learning environment:

- ○ Always
- ○ Usually
- ○ Sometimes
- ○ Rarely
- ○ Never

5. Students recognise real-life applications of mathematics by engaging with real-life problems:

- ◯ Always
- ◯ Usually
- ◯ Sometimes
- ◯ Rarely
- ◯ Never

6. Teaching and learning is student-centred i.e. approaches used are wholly based on the interaction and engagement of the students in the classroom:

- ◯ Always
- ◯ Usually
- ◯ Sometimes
- ◯ Rarely
- ◯ Never

7. Students use a variety of resources to enhance learning:

- ◯ Always
- ◯ Usually
- ◯ Sometimes
- ◯ Rarely
- ◯ Never

8. Could you briefly list common resources used if you chose "Always", "Usually", "Sometimes" or "Rarely" in question 7. If "Never" was chosen, type N/A.

9. I consult the Primary School Curriculum when designing mathematical lessons:

- ◯ Always
- ◯ Usually
- ◯ Sometimes
- ◯ Rarely
- ◯ Never

10. I consult the Junior Certificate Mathematics Syllabus when designing mathematical lessons:

- ◯ Always
- ◯ Usually
- ◯ Sometimes
- ◯ Rarely
- ◯ Never

11. I adapt teaching methodologies to create a continuum in learning of mathematics for students who transfer from primary to post-primary school

- ◯ Always
- ◯ Usually
- ◯ Sometimes
- ◯ Rarely
- ◯ Never

12. I collaborate with primary school teachers to gain insight into aspects of teaching and learning of mathematics at primary school level.

- ◯ Always
- ◯ Usually
- ◯ Sometimes
- ◯ Rarely
- ◯ Never

13. I collaborate with post-primary teachers to gain insight into aspects of teaching and learning of mathematics at post-primary level

- ◯ Always
- ◯ Usually
- ◯ Sometimes
- ◯ Rarely
- ◯ Never

14. Does your school faciliate any programmes/events that aim to ease the transition from primary to post-primary school?

- ◯ Yes
- ◯ No

15. If you answered "Yes" to question 14, please provide details of such programmes/events. If you answered "No", please type "N/A".

Appendix H

Lesson Observations;

Structured

Data Recording

Template

Appendix H

Structured Lesson Observation Template

Lesson Observation

Date: ________________ Class: ________________________

Time: ________________ School: _______________________

Classroom Environment	Student number: Gender Breakdown
Teaching Methodologies Employed	Student Participation
Mathematical Topic Covered	Assessment Strategies
Resources Used	Curriculum Section

Other Comments:

____

____

____

____

Signature of Teacher: ___________________ Date: _______________

Signature of Researcher: __________________ Date:_______________

Appendix I

List of Abbreviations

Appendix I List of Abbreviations

AfL:	Assessment for Learning/Formative Assessment
AoL:	Assessment of Learning/Summative Assessment
CBA:	Classroom Based Assessment
CIC:	Common Introductory Course
DES:	Department of Education and Skills
ICT:	Information and Communications Technology
LYIT:	Letterkenny Institute of Technology
MALT:	Masters of Arts in Teaching and Learning
NCCA:	National Council for Curriculum and Assessment
NFER:	National Foundation for Education
OECD:	Organisation for Economic Co-operation and Development
PII:	Personally Identifiable Information
PISA:	Programme for International Student Assessment
SEN:	Special Educational Needs
SCL:	Student Centred Learning

STen: Standard Ten

TIMSS: Trends in International Mathematics and Science Study

UK: United Kingdom

US: United States

UNESCO: United Nations Educational, Scientific and Cultural Organisation