The role of expectancy-value theory in upper secondary level students' decisions to avoid the study of advanced mathematics

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Widening and increasing participation in advanced mathematics studies at upper secondary level (age 16-18) is a significant challenge for most education systems. Policy makers in Ireland have attempted to address this challenge over the past decade by introducing an incentive to encourage students to study advanced mathematics. This study examines the reasons why students, who would appear to have sufficient prior achievement to enable them to engage in advanced mathematics studies at Upper Secondary Level, opted not to do so even with the presence of this incentive. Responses to questionnaires completed by 183 students in 10 secondary schools across Ireland were analysed. This analysis indicated that these students tended to avoid engaging in advanced mathematics study at upper secondary level for a range of reasons. Most cited the expectation that they would struggle or had struggled too much with advanced mathematics. Other commonly cited reasons included the amount of time and effort required to engage effectively in the study of advanced mathematics and the impact this would have on time available to study other subjects.

Keywords: Advanced secondary mathematics; expectancy-value theory; mathematics education; incentives.

Introduction

In Ireland, as in many other nations, emphasis has been placed on enhancing STEM (Science, Technology, Engineering, Mathematics) education in order to achieve better outcomes for all learners and as a means of contributing to the nation's economic prosperity (Department of Education and Skills 2017). The Department of Education and Skills (2017) have indicated that demand outweighs supply of students completing secondary and tertiary education with the knowledge and skills in STEM subjects which are sought by employers, which is in keeping with findings elsewhere (The Royal Society 2014; Hine 2019). Change in education policy in Ireland over a decade ago aimed to address this challenge in part by transforming the country's secondary mathematics curricula and introducing an incentive to study advanced mathematics (age 16-18) (Department of Education and Skills 2010). This incentive, which took effect in 2012 and is commonly referred to as 'bonus points', has had a significant impact on the proportion of students opting to study upper secondary level mathematics at the most advanced level (Higher Level). The aforementioned proportion has increased from 15.8% in 2011 to 32.9% in 2019 after a steady rise in the intervening years (Treacy, Prendergast, & O'Meara 2020). In 2022, this figure stood at 37.1%, however adjustments to the assessments in this year to compensate for missed school time due to measures implemented during the COVID-19 pandemic reduce the validity of this statistic as a suitable comparison to other years.

While there has been research into the reasons for this increase in the proportion of students opting for Higher Level mathematics study from the perspective of teachers (e.g. Treacy et al. 2020; Prendergast, O'Meara, & Treacy 2020; O'Meara, Prendergast, & Treacy 2020), there has been little examination of the student perspective. This article will examine the perspective of a particularly interesting stratum of students – those students that would appear to be capable of taking on the challenge of mathematics at this level but have decided not to do so, even with the incentive of bonus points.

Avoiding Advanced Mathematics Study

The challenge of engaging and retaining students in advanced mathematics study at upper secondary level is a complex problem. Policy makers often look to high-performing education systems (e.g. East Asian regions such as Singapore, Shanghai, and Hong Kong) for inspiration to inform curriculum and policy design as well pedagogical approaches (Cantley 2019). Singapore and New Zealand are highlighted as two countries in which uptake of advanced mathematics study at upper secondary level is high even though advanced mathematics study is not compulsory in either region (Hodgen et al. 2013). Flexibility for students through choice of varying pathways in mathematics (e.g. a focus on calculus or statistics) and through length of study (e.g. taking an extra year to master content and fluency) have been highlighted as beneficial policies in Singapore and New Zealand (Hodgen et al. 2013). Allowing students to tailor their study of advanced mathematics to suit their individual needs and match future aspirations appears to have a positive impact on uptake.

Hine (2019) examined reasons given by 1,351 Year 11 and 12 students (ages 17-18) in 26 Western Australian schools as to why they didn't enrol in higher level mathematics courses. Dissatisfaction with mathematics (e.g. overly challenging, high workload, lack of interest and confidence) was the most common response. Choosing other more suitable courses, the lack of need for higher level mathematics to gain university entrance, and discrepancy between effort required and reward through overall grade were other reasons cited (Hine 2019). Similar responses have been noted in England (Brown, Brown, & Bibby 2008; Noyes & Adkins 2016) as well as a combined analysis of Australia, Canada, and the US (Watt et al. 2012). Noticeable increases in difficulty when transitioning from mathematics study at lower secondary level to upper secondary or post-16 level have also been highlighted as barriers for students when choosing to study or persist with advanced mathematics (Rigby 2017). Students may often require increased support to overcome this ‘jump’ in mathematical difficulty to aid effective transition.

The key factors which influence students when making important decisions of this nature regarding their education can be better understood by exploring the theory which underpins such a decision-making process. Expectancy-value theory offers a comprehensively researched foundation for forming this understanding.

Expectancy-Value Theory

Student decision-making processes and attitudes need to be considered when constructing an enhanced understanding of the factors which affect participation in advanced mathematics at upper secondary level. Expectancy-value theory posits that a person’s achievement related choices are strongly influenced by their expectancy of success within the task and the value they place on the task itself (Eccles & Wigfield 2020). As such, a person tends to display more motivation to engage in a task if they believe they can be successful and believe completion of the task to be worthwhile. These two characteristics are distinct constructs but research suggests that they typically correlate, indicating that a person tends to place more value on areas within which they believe they can be or have been successful (Eccles & Wigfield 2020).

Motivation to engage in a task is large when both expectancy and value are high but disappears when either factor falls to zero (Studer & Knecht 2016). Similarly, these two factors tend to directly impact performance, persistence, and choice (Eccles & Wigfield 2020; Studer & Knecht 2016). Expectancy is often defined by two key facets – the person’s belief that they can perform the given task at the required level and the likelihood that performance of the task will lead to the desired outcome. Task value can be further broken down into four subcomponents: *attainment value* (the importance of doing well), *intrinsic value* (personal enjoyment), *utility value* (perceived usefulness for future goals), and *cost* (competition with other goals) (Eccles & Wigfield, 2020).

Student engagement with advanced mathematics study can be explored using expectancy-value theory as a framework. Motivation to engage with, persist with, and achieve success within advanced mathematics are commonly impacted by expectation of success and the value placed on engaging with mathematics at this level (Hine 2019; Rigby 2017; Brown et al. 2008). In subsequent sections of this article, this framework will guide the exploration of the student decision making process which ultimately dictates levels of participation in advanced mathematics at upper secondary level in Ireland. To further inform our understanding of this process, the current context within which these decisions are made will be examined.

Context & the Bonus Points Incentive (BPI)

Mathematics at secondary level in Ireland has been subject to significant change over the past decade. New curricula were introduced for Junior Cycle (initial three years of secondary education, age 12-15) and Senior Cycle (final two years of secondary education, typically age 16-18) from 2010 onwards. These new curricula placed greater emphasis on problem solving and real world applications of mathematics (Department of Education and Skills 2010) – a notable departure from the perceived emphasis on procedural fluency which was evident in the application of the previous curricula (National Council for Curriculum and Assessment 2005). While the nature of the curricula changed considerably, the means by which students were formally assessed did not. Grades based on student achievement at Junior Cycle continued to be fully determined by performance in final state examinations upon completion of this cycle until very recently. In 2018, two Classroom Based Assessments to be completed in the 2nd and 3rd year of the Junior Cycle were introduced from 2021 onwards (National Council for Curriculum and Assessment 2022). However, the final examination at this level continues to account for 90% of a student's final grade. Students can opt to complete their national examinations at one of two levels for Junior Cycle (Higher or Ordinary) and one of three levels at Senior Cycle (Higher, Ordinary, or Foundation). Senior Cycle students continue to be assessed solely by performance in final state examinations upon completion of this cycle, however this may change in the near future upon completion of the current Senior Cycle review.

During the aforementioned period of major curriculum reform over a decade ago, mathematics was also assigned a special status amongst subjects studied at upper secondary level with the introduction of the 'Bonus Points Initiative' (BPI) (Treacy et al. 2020). The final examinations for Senior Cycle, commonly referred to as the Leaving Certificate examinations, play a significant role in whether or not a student may gain access to their chosen tertiary level course. Students are awarded points based on their achievement in six of their subjects in the Leaving Certificate examinations. Prior to the introduction of BPI, the maximum a student could achieve in any given subject was 100 points (see Table 1), thus the maximum number of points they could achieve overall was 600. This changed in 2012 with the introduction of the BPI which awarded students an extra 25 points for achieving a passing grade (H6 or better in the current grading system) in the Higher Level Leaving Certificate mathematics examinations. For example, a student awarded a H5 grade would achieve 56 points and the additional 25 bonus points, resulting in a total of 81 points.

Table 1. Points awarded for grades achieved in Leaving Certificate examinations.

Examination Score	Higher Level Grade	Higher Level Points	Ordinary Level Grade	Ordinary Level Points
90% - 100%	H1	100	O1	56
80% - 89%	H2	88	O2	46
70% - 79%	H3	77	O3	37
60% - 69%	H4	66	O4	28
50% - 59%	H5	56	O5	20
40% - 49%	H6	46	O6	12
30% - 39%	H7	37	O7	0
0% - 29%	H8	0	O8	0

From 2012 onwards, students could achieve a maximum of 125 points in their mathematics Leaving Certificate examinations compared to a maximum of 100 points in any other subject. This change appears to have had a noticeable impact on the proportion of students opting to complete the Leaving Certificate mathematics examinations at Higher Level, with a steady increase from 15.8% in 2011 to 32.9% in 2019[1] (see Fig. 1). While this proportion has increased noticeably, an accompanying rise in overall mathematics standards for these cohorts does not appear to have occurred in tandem as may have been expected (O'Meara et al. 2020; Treacy 2018). Prendergast et al. (2020) surveyed 266 Senior Cycle mathematics teachers regarding the BPI and found that a total of 79% recommended a review (56%) or discontinuation (23%) of the initiative. Many of the participants in this study recognised the positive effects of the initiative on the proportion of students opting for Higher Level mathematics at Senior Cycle

[1] The proportion in 2020 (54.2%) was not relevant as only a small number of students completed the actual examinations in 2020 given that predicted grades were widely used due to implemented measures related to the COVID-19 pandemic. In 2021, the vast majority of students availed of the option to be awarded either a predicted grade or their actual examination grade (whichever turned out to be better). As such, this cohort is difficult to compare to previous cohorts in their decision whether or not to opt for studying mathematics at Higher Level. In any case, this proportion was 40% in 2021. The 2022 figure of 37.1% is somewhat more reliable but alterations to the typical examination structure lead the authors to conclude that comparison with pre-2020 figures would not be suitable.

but also highlighted issues such as questionable student motivation to study the subject and negative impacts on their teaching, particularly in relation to the pace of lessons.

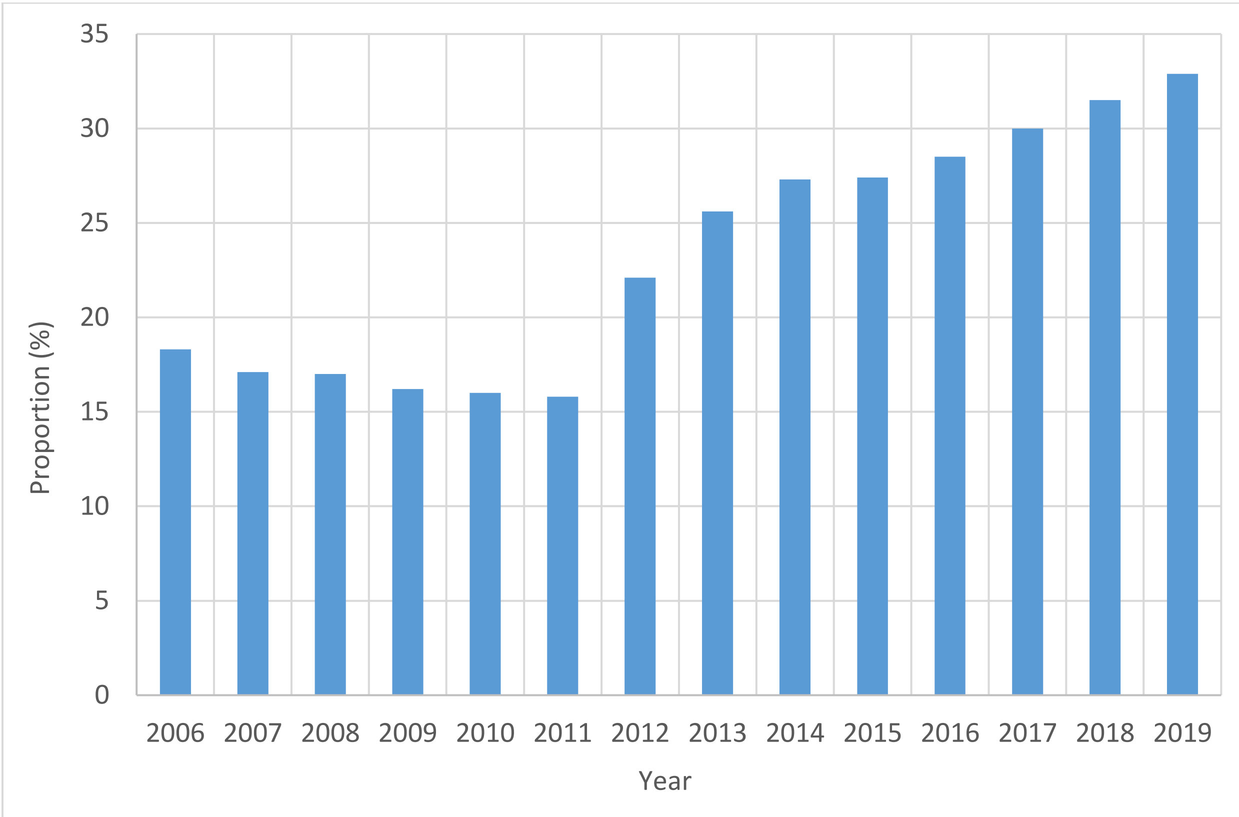

Figure 1. Proportion of students opting to complete their Leaving Certificate mathematics examination at Higher Level during the years 2006 to 2019.

Overall, the BPI appears to have had a significant impact on the proportion of students opting to study mathematics at Higher Level for Senior Cycle. However, there is still a stratum of students who, given performance at Junior Cycle, would appear to have the capabilities to engage with mathematics at Higher Level for Senior Cycle but opt not to do so. This stratum will be the focus of the current study.

Method

This particular study was part of a larger overall research project which gathered both quantitative and qualitative data from 1706 Senior Cycle students (911 Higher Level students, 795 Ordinary Level students) from 10 schools in the Republic of Ireland through the completion of questionnaires. The aim of the current study was to determine the reasons why students who had achieved a Higher Level B grade or C grade at Junior Cycle in Ireland decided at one point or another not to study mathematics at Higher Level for Senior Cycle. Achieving a Higher Level B grade or C grade at Junior Cycle would suggest that these students have the requisite prior attainment to study mathematics at Higher Level for Senior Cycle. For example, 71.6% of the 911 Higher Level students involved in overall research project linked to this study had achieved a Higher Level B grade (41.4%) or C grade (30.2%) at Junior Cycle, thus indicating that such prior achievement can form a sufficient foundation to engage in this level of study. Gaining a better understanding for the reasons why students who achieved a Higher Level B grade or C grade at Junior Cycle chose not to study mathematics at Higher Level for Senior Cycle – especially given the bonus points on offer – will provide important insights for teachers and policy makers.

The above observations led to the research question which underpins this study: Why do Upper Secondary Level students, who would appear to have sufficient prior achievement to enable them to engage in advanced mathematics studies, opt not to do so even with the presence an incentive?

The primary research tool utilised in this study was a questionnaire. This was deemed to be the most effective tool to gather in-depth responses from a large number of participants thus providing a diverse range of responses. Questionnaires also ensure anonymity and thus encourage greater levels of honesty leading to more reliable data (Cohen, Manion, & Morrison, 2017). There were 27 items within the questionnaire: 4 items requesting basic information about the student (e.g. current year of study, Junior Certificate grade), 19 items within which students responded to statements using the 5-point Likert scale (strongly agree to strongly disagree), and 3 items which requested responses to open ended questions. These items were designed in order to elicit participating students' reasons for opting to study mathematics at Ordinary Level for Senior Cycle and any factors or people (e.g. parents, teachers, friends) that influenced their decision.

In September 2019, following ethical approval, participants were recruited through convenience sampling as the researchers contacted school administrators with whom they had previously worked. Upon obtaining permission from the gatekeeper at each school, the researchers provided consent forms to students who met the criteria (Senior Cycle students studying mathematics at Higher Level or Ordinary Level) and, at a later date, provided questionnaires to be completed by all those who had returned completed consent forms.

Once this process was completed, the quantitative data was recorded and transferred into an SPSS (version 25) file for analysis. Responses to qualitative items were transcribed into a Microsoft Word file and then transferred to Nvivo (version 11) for content analysis. 183 participants in this project satisfied the criteria for this particular study – 37 students achieved Higher Level B grades and 146 achieved Higher Level C grades at Junior Cycle but decided at one point or another to study mathematics at Ordinary Level rather than Higher Level for Senior Cycle. The application of content analysis ensured a systematic examination and interpretation of the qualitative data to derive patterns and themes which informed our overall findings. The themes identified through content analysis were not pre-defined. The authors read and re-read the data, then coded the data in Nvivo which enabled the identification of the initial themes. This process was then further informed by expectancy-value theory due to the clear links between student justifications for their choices identified in the initial analysis and the features of this theory.

Findings

The findings of this study will be summarised according to the overall reasons given by respondents for avoiding Senior Cycle Higher Level mathematics, followed by a further in-depth overview of the key themes which were identified during content analysis of the qualitative data. These key themes included difficulty level, time, effort, and other subjects. Finally, there will be insights into the influences on their decisions as well as the timing of their decision.

Overall Reasons and Attitudes to Mathematics

Students in this study that opted to study Ordinary Level mathematics at Senior Cycle despite achieving Higher Level B grade (N = 37) or C grade (N = 146) at Junior Cycle justified their decision for a range of reasons. When asked to choose the single most influential factor impacting their decision, the most common factor selected (42% of respondents) was the belief that they would struggle with Higher Level mathematics, while another 13% indicated that Ordinary Level mathematics would be sufficient to gain entry to their preferred tertiary education course. Other reasons such as lack of confidence in mathematical ability (9.7%), not liking mathematics (1.4%) and not finding the subject interesting (1.4%) were selected by a total of 12.5% of respondents.

Only 2.8% indicated that either a dislike of mathematics or not finding the subject interesting were the single most influential factor impacting their decision. As such, negative attitudes towards mathematics were not particularly highlighted by these students as important elements in their decision. In general, attitudes towards mathematics were mixed amongst this group of students as 38.8% agreed or strongly agreed that they don't find mathematics interesting, 31.1% neither agreed or disagreed, while 30.1% disagreed or strongly disagreed (see Fig. 2). 38.3% agreed or strongly agreed that they don't like mathematics, 27.3% neither agreed or disagreed, while 34.4% disagreed or strongly disagreed.

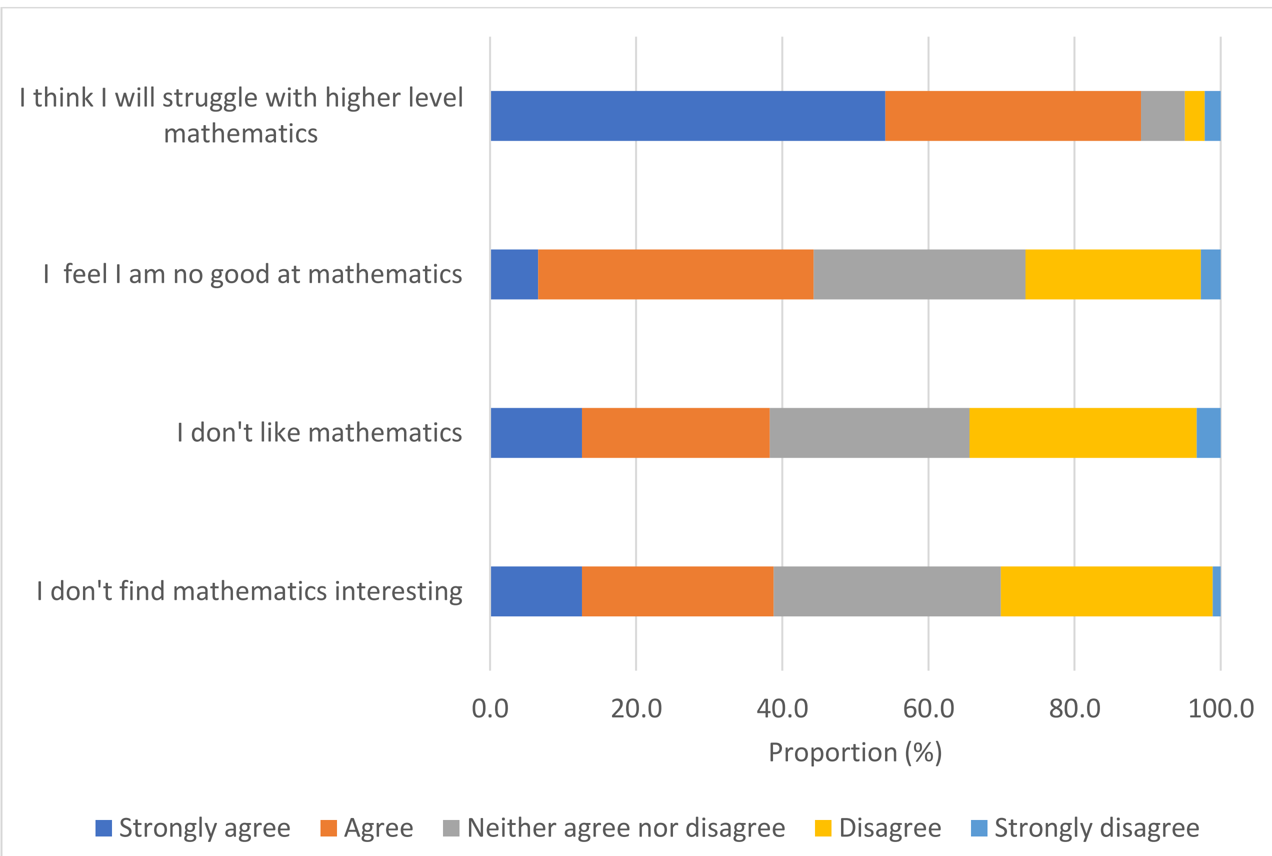

Figure 2. Responses of students in the given sample to selected questionnaire items.

Difficulty Level and Stress

As indicated in the previous section, 42% of respondents in this study cited their expectation that they would struggle as the single most important factor affecting their decision to avoid Higher Level mathematics. Exploring this further, 89% of respondents in this study agreed or strongly agreed that they believe that they would struggle with Higher Level Senior Cycle mathematics (see Fig. 2).

In-depth insights were gained through responses to the open-ended question "Are there any other reasons why you chose to study ordinary level mathematics? Please explain." Coding of this data indicated that the difficulty of Higher Level mathematics was a key reason for many of these students opting for Ordinary Level. There were regular references to mathematics being "extremely difficult", "impossible", and "too hard". The workload involved and the associated stresses were also regularly mentioned:

> *"HL [Higher Level] maths was too difficult. There is too much of a jump between OL [Ordinary Level] and HL. I did HL maths for 5th year and it cause too much stress. I would get upset before tests and studying and homework was taking up too much time." (S552)*

> *"I would have chosen HL maths because of the extra 25 points but since I struggled with it for the JC, I knew I wouldn't be capable of completing the HL LC maths course. However, I do enjoy maths a lot more now as I understand most things."* (S526)

> *"HL is like a completely different language in the LC [Leaving Certificate]." (S625)*

Time, Effort, and Other Subjects

Further reasons for avoiding Higher Level mathematics at Senior Cycle were evident during analysis of this qualitative data. Key themes which were identified included the amount of time and effort required to engage in mathematics at this level and how this impacted other subjects. Respondents indicated that they needed to be pragmatic when making a final decision on the level of study they chose:

> *There was too much time and dedication required for higher level maths and I don't need higher level maths for my chosen course. (S461)*

> *I chose to do OL maths because I was in HL until start of 6th year. I moved to OL because it was taking from my other subjects and I felt it was too time consuming to keep up. (S678)*

> *HL was taking up too much time – I wanted to concentrate on my strong subjects that I enjoy. I didn't understand how the teacher I had was explaining things. (S638)*

The statements above and other similar responses indicate that quite a number of students analysed the time and effort that would be required to engage effectively in the study of Higher Level mathematics at Senior Cycle and decided that it would not be worthwhile. Further examples of this way of thinking are highlighted below. It is also interesting to note how there was regular overlap between respondents citing struggle and stress with consideration of time, effort, and other subjects:

To get a good grade in higher level it could take too much time. This would take away from my other subjects. To do well in higher level maths it would need to take the majority of the time I spend studying and other subjects would suffer. I thought I would find higher level maths a cause of stress and pressure. (S470)

The level of work and stress involved in HL put me off. I could pick up better grades in other subjects rather than focusing on maths. (S593)

"I feel as though higher level maths is too hard and I will struggle. Too much commitment to the subject I am not gifted at will mean my other subjects will struggle too" (S359)

I chose OL because I found HL maths was putting major stress on me and taking away valuable study time from other subjects. (S574)

The responses above were typical of the multifaceted justifications that respondents gave for making the decision to choose Ordinary Level over Higher Level for Senior Cycle mathematics.

Influences and Timing of the Decision

When asked to indicate the reasons why they chose to study mathematics at Ordinary Level for Senior Cycle, only 4.9% agreed that they were not given a choice whether or not to study Ordinary Level mathematics, so it seems like these students typically had the final call on this decision. Parents appear to have had a moderate influence on their decision making as 37.2%

agreed or strongly agreed that their parents suggested they opt for Ordinary Level mathematics, while 45.4% disagreed or strongly disagreed with that statement. Friends, teachers, and career guidance councillors had little impact on student decision making according to responses.

Finally, the decision to opt for Ordinary Level mathematics for Senior Cycle was taken at different junctures by the respondents (See Fig. 3). Most took this decision during 5th Year (initial year of Senior Cycle) which indicates that they intended to study mathematics at Higher Level for Senior Cycle but eventually decided otherwise. A noticeably higher proportion of students who achieved Higher Level C grades at Junior Cycle (26.8%) took the decision immediately upon completion of Junior Cycle compared to students who achieved Higher Level B grades (4.3%). This may indicate a firmer stance amongst this stratum in relation to making the decision to opt for Ordinary Level at Senior Cycle.

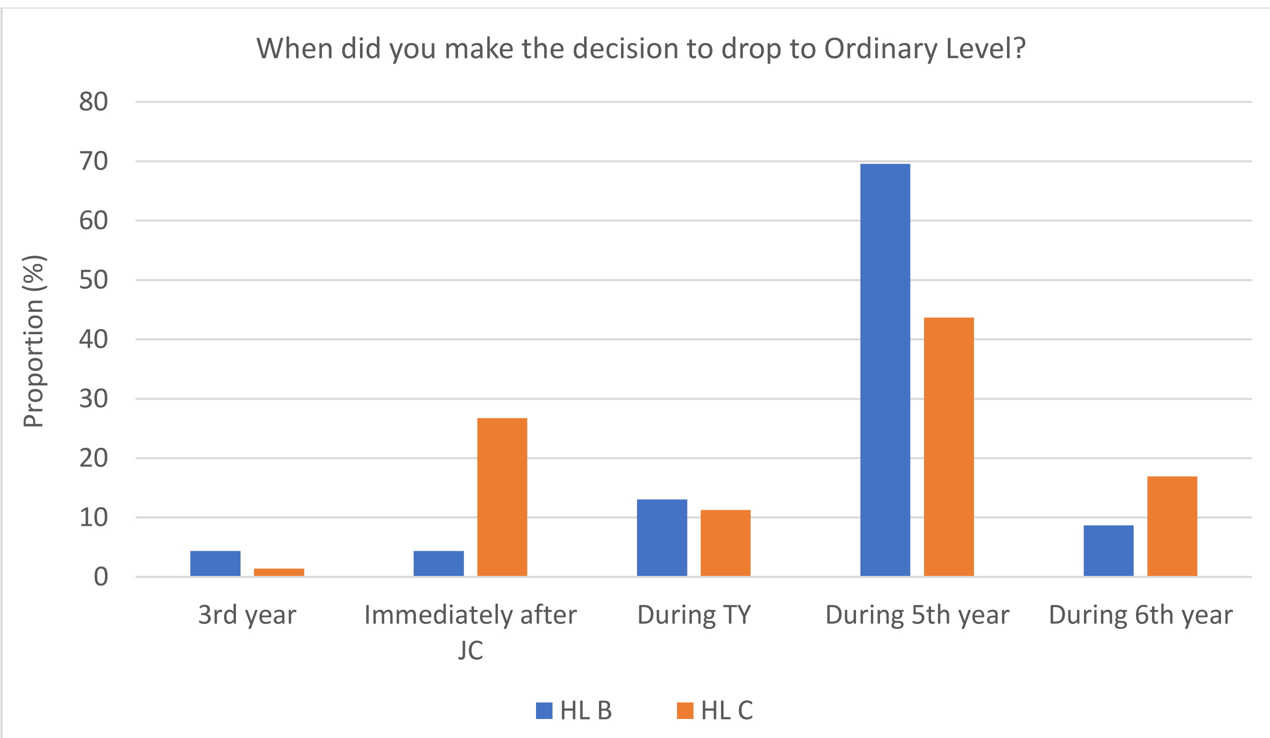

Figure 3. The timing of students' (with Higher Level B grades or C grades at Junior Cycle) decision to opt to study mathematics at Ordinary Level for Senior Cycle.

Discussion

The reasons outlined by students to avoid studying Higher Level Senior Cycle mathematics, despite achieving a Higher Level B or C grade at Junior Cycle, clearly link to their expectancy of success and the associated task value. The vast majority of respondents (89% in total) expected they would struggle with Higher Level Senior Cycle mathematics, indicating low expectancy of success. Similarly, the associated task value was highlighted as respondents commonly cited the amount of time required to engage effectively with Higher Level mathematics and the impact this would have on the study of other subjects. As such, expectancy-value theory provides a suitable framework within which to interpret the decision-making processes of these students.

Rigby (2017) identified similar issues related to expectancy of success amongst students in the UK transitioning to the study of Upper Secondary advanced mathematics (AS Levels). Her analysis of semi-structured interviews with 28 students indicated that they felt there was too great a leap in challenge from their previous mathematics studies (GCSE level mathematics) and that support to bridge this gap would address some of the attrition. Greater support for students opting for Higher Level mathematics, particularly in the initial stages of Senior Cycle, may assist in helping students to bridge the gap from Junior Cycle to Senior Cycle successfully. Most students in this study indicated that they opted out of Higher Level mathematics in the initial year of Senior Cycle (see Fig. 3) which suggests that they wanted to study mathematics at this level but then decided to opt out.

Allied to questioning their expectancy of success, the task value that students placed on studying mathematics at this level was consistently identified within their reasoning. As indicated previously, task value can be broken into four sub-components: *attainment value* (the importance of doing well), *intrinsic value* (personal enjoyment), *utility value* (perceived usefulness for future goals), and *cost* (competition with other goals). Cost was a key reason for many to opt for Ordinary Level mathematics as students regularly cited the time required to engage effectively with Higher Level mathematics study negatively impacted their engagement with other subjects. The utility value of studying Higher Level mathematics was also cited as some students indicated that they did not need to study mathematics at that level for their chosen university program. Issues linked to intrinsic value were identified at times also as students referenced the stresses and struggles related to studying Senior Cycle mathematics at Higher Level. It was clear that personal enjoyment of mathematics suffered as a result and opting for Ordinary Level mathematics study provided some relief from these strains. For example, one respondent stated they "enjoy maths a lot more now as I understand most things" since moving to Ordinary Level.

Hine's (2019) analysis of the reasons given by Year 11 and 12 students (ages 17-18) in Western Australian schools produced similar explanations to those outlined in this article as students identified reasons such as preferring to use their time to focus on other subjects, dissatisfaction with mathematics, and matriculation to their preferred tertiary course of study only requiring a lower level of mathematics qualification. Interestingly, Hine (2019) noted that students felt there needed to be more incentive to select higher level mathematics as a course of study. Such an incentive seems to have worked in Ireland to a certain extent as the proportion of students opting to complete Senior Cycle mathematics at Higher Level increased from 15.8% in 2011 (before bonus points were introduced) to 32.9% in 2019. However, students in Ireland who avoid Higher Level mathematics study at Senior Cycle continue to cite similar reasons to their Australian counterparts.

While understanding the reasons for the decisions taken by students participating in this study is important, recognising the associated action to be taken is not particularly clear. It might be argued that the workload required to study Higher Level mathematics at Senior Cycle is too heavy and needs to be examined in order to make it more accessible. This would address the issue of students opting for Ordinary Level study so that their other subjects don't suffer. However, this may 'water down' the challenge of studying mathematics at this level and thus leave students unprepared for the challenges that might lie ahead in tertiary level education and/or the workplace. Recent studies have indicated that students' level of preparedness to transition to tertiary level study of mathematics in Ireland may already be in question (Fitzmaurice, Walsh, & Burke 2021; Treacy & Faulkner 2015; Treacy, Faulkner, & Prendergast 2016). Striking a balance in this respect is a consistent challenge for education systems.

New Zealand and Singapore have proven to be some of the most successful nations in relation to achieving high participation rates in upper-secondary (or post-16) mathematics (Hodgen et al. 2013). Their successes are due in no small part to the provision of multiple high-status routes for the study of mathematics as students can tailor their mathematical studies to align with current and future courses (Hodgen et al. 2013). For example, they might choose to study mathematical applications and fluency as well as statistics which would provide a suitable grounding for further studies in life sciences and social sciences. Specialization of this nature in an Irish context could aid in providing a manageable workload for students when studying Higher Level mathematics at Senior Cycle while maintaining standards and expectations. Senior Cycle students currently engage with five strands in mathematics - Statistics and Probability; Geometry and Trigonometry; Number; Algebra; and Functions (Department of Education and Skills 2010). This provides significant breadth in students' mathematics studies but one might question whether this is at the expense of sufficient depth. Opportunities to tailor their mathematical studies may allow for greater depth in certain strands and also aid student value of the discipline as they can better recognise the links between the mathematics they are studying and the future directions they wish to take.

Consideration should also be given to the number of subjects students are expected to study at Senior Cycle. Respondents in this study often indicated that they found it difficult to balance the amount of time required to effectively engage in the study of Higher Level mathematics and the time needed for other subjects. O'Meara & Prendergast (2017) recently examined the amount of time allocated to mathematics in secondary schools in Ireland. Although they found that the amount of time dedicated to the subject was in line with other OECD countries, they noted that the number of subjects studied by upper secondary students in Ireland was above average when compared to their counterparts in other OECD countries. As such, they recommended that the number of subjects students study at Senior Cycle should be reduced in order to dedicate further time to all subjects, including mathematics. Such an adjustment would also give students further flexibility when allocating study time outside of school hours.

Conclusion

Increasing and widening participation of upper secondary level students in advanced mathematics studies is a challenging task which has no clear solution. The participants in this study appeared to have sufficient prior achievement to prepare them to effectively engage in the study of Senior Cycle mathematics at Higher Level, as well as the incentive of bonus points, yet they decided against it. The key reasons consistently cited by these students included struggling with the content, the amount of time required to engage effectively, and, as a result, the lack of time available to dedicate to other subjects. Ultimately, when student expectation of success declined and/or the value they attached to completing their Senior Cycle mathematics studies at Higher Level reduced, they took the decision to opt for Ordinary Level studies.

Enhanced support for students, particularly in the initial stages of Senior Cycle may aid students in making a successful transition from Junior Cycle to Senior Cycle Higher Level mathematics as this appears to be a critical juncture. Such a measure may positively impact student expectation of success in their study of mathematics at this level, thus leading to better retention. Additionally, exploring the impact of a reduction in the number of subjects students are expected to study at Senior Cycle may allow for greater flexibility for students to allocate more study time to their chosen subjects. This could improve retention of students in Higher Level mathematics classes as it should lead to a reduction in pressure on students to decide where to allocate their study time – a factor commonly cited by participants in this study.

Providing greater choice through multiple high-status routes for the study of mathematics may be the solution for increasing the value students place on advanced mathematics study as they may see clearer links to their future studies. Similarly, tailored studies of this nature would reduce workload – a key issue highlighted by participants in this study – thereby potentially enhancing expectancy of success. Incentives such as bonus points could still be maintained in some form in order to retain the benefits of this measure. For example, the incentive could still be in place for those that take on the challenge of a broad range of strands or could be awarded on a sliding scale based on overall grade achieved. Bonus points appear to aid student motivation to study Higher Level mathematics at Senior Cycle, however, alternative measures may be required to ensure that motivation is sustained.

Disclosure Statement

No potential conflict of interest was reported by the authors.

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