

The Role of Curriculum Quality and Teaching Methods in Shaping Students' Intentions to Pursue Mathematics in Higher Education

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Received November 25, 2025; Revised December 27, 2025; Accepted January 03, 2026

Abstract Mathematics is the epitome of all societies, providing communication across STEM disciplines and other areas such as the arts, law, social sciences, and medical sciences. Throughout the years, there have been many mathematics interventions across all areas of the educational system; however, the enrollment rate at the tertiary level in mathematics-related degree programmes continues to remain comparatively low. This highlights issues related to students' quality engagement with the mathematics curriculum in secondary education and their level of exposure to mathematics-related career fields. This study aimed to explore what influences students' motivation to pursue mathematics in higher-level education, which is crucial for policymakers, educators, and curriculum designers. The research leveraged a mixed-methods approach, utilising the convergent parallel design with 434 students at the secondary level across 31 schools at the Grade 11-13 level, who were at least 18 years old. The data analyses included descriptive statistics, chi-square tests, themes and codes, and binary logistic regression. The findings revealed that the majority of the students (80.11%) believed their experiences in the teaching and learning process were very satisfactory. On the other hand, 66.82% of them were engaged with real-life mathematics applications, while, contrastingly, 88.7% expressed the need for better mathematics teachers who can influence their career decisions, particularly in mathematics-related fields. The association between students' perceptions of teaching quality and their decision to pursue mathematics-related studies is moderately strong. While students who experienced high quality instruction were far more likely to pursue mathematics at the tertiary level. These findings highlight the urgent need for a more effective curriculum that is engaging, coupled with sustained teaching improvements and positive social influences to address declining enrollment. Combined, this would impact their attitudes and build long-term student interest. Additionally, the findings underscore the need for a longitudinal study focused on exploring instructional improvement as well as assessment of targeted professional development sessions for teachers that ultimately can influence students' enrollment in mathematics-related degrees.

Keywords: curriculum, teaching methods, mathematics education, higher education

Cite This Article: Orinthia Fisher-Howe, and Shaneille Samuels, "The Role of Curriculum Quality and Teaching Methods in Shaping Students' Intentions to Pursue Mathematics in Higher Education." *American Journal of Educational Research*, vol. 14, no. 1 (2026): 14-29. doi: 10.12691/education-14-1-2.

1. Introduction

Through mathematics, Ref [1] stated that one could effectively build a mental discipline while encouraging mental rigour and logical reasoning. Serving as a fundamental subject and as the essential tools in various fields such as science, technology, engineering, economics, and finance, the world around us is influenced by this subject Aithor [2]. Additionally, according to Maass *et al.* [3], from designing bridges and building to predicting stock prices, mathematics provides the framework for solving complex real-world problems. Without mathematical principles, computer programming, such as robotics, artificial intelligence, and numerous technological advancements, would be unfeasible.

Based on the contribution of mathematics to individuals and nations, in Jamaica, the country's emphasis on improving science and technology and innovation skills among youth, mathematics education plays a vital role in its development to enhance economic growth and innovation [4]. As the country enhances its initiative to boost participation in the STEM field at the tertiary level, it becomes crucial to comprehend factors influencing a student's choice to pursue mathematics in higher education. However, Reid & William [5,6] and Samuels [7] inferred that the enrolment of students in mathematics-related degree programmes continues to remain comparatively low, despite many strategic priorities, highlighting issues about the quality of the curriculum and the instrumental methods in secondary education. Note that this is not unique to Jamaica, because American education systems are also experiencing this decline first

noted by President Ronald Reagan in 1986 which still persists [8]. Suri [8] reported that in 2020 about 1.4% of the 1.9 million bachelor's degrees related to mathematics majors were rewarded; as compared to 1.63% of almost 1 million of those same degrees between 1985 and 1986. Suri [8] pointed out as well that an average of 27,000 students are graduating with mathematics degrees but there about 30,600 mathematics jobs available every year based on growth and replacement needs. However, there are not enough graduates filling these positions based on the 3,600 fall short. Additionally, Suri [8] commented that even amongst the 27,000 graduates, there are individuals who opted to not take up these jobs causing further job shortages. Furthermore, Quadir [9] reported similar issues in England. Quadir [9] shared that mathematics is the most popular A-level subject done yearly by between 85,000 and 90,000 students which is necessary to attend the universities. However, there was a 50% drop in students pursuing mathematics degrees at lower tariff universities between 2017 and 2021 [9]. With the low enrollment of students since, mathematics departments are considering whether to remain open. Additionally, 500 businesses shared in a survey commissioned by the London Mathematical Society their concerns about not having enough future ready mathematics graduates available to be employed [9]. This indicates that this is a global phenomenon. Therefore, mitigating this gap is essential for unfolding strategies that augment students' engagement and accomplishment, which, in the course of time, contribute to national development goals in STEM fields.

Research indicates that students' motivation to pursue a higher education Mathematics degree is significantly influenced by the relevance, rigor, and engagement of the curriculum. According to Ref [7,10], a well-designed curriculum that integrates real-world applications and active learning strategies fosters positive attitudes and increases students' aspirations.

As many students struggle with learning mathematics at some point, possessing an understanding of the complex relationship between the quality of the teaching practices, curriculum, and students' goals is detrimental to developing impactful strategies designed to boost enrollment of Caribbean students in the tertiary mathematics programmes. This study aims to explore how curriculum and pedagogy influence students' perceptions and intentions regarding higher education in mathematics within the Jamaican context.

1.1. Purpose of the Study

This study aimed to comprehensively investigate and analyze students' perceptions and views on the role of curriculum quality and teaching in driving students' decisions to enroll at the tertiary levels in mathematics-related fields.

1.2. Research Questions

To guide this investigation, the researchers explored the following research questions:

1. How do students perceive the quality of mathematics teaching and curriculum at the high school level in Jamaica?

2. To what extent does perceived curriculum quality influence students' intentions to pursue mathematics-based degrees at the tertiary institutions in Jamaica?

1.3. Research Hypotheses

Null Hypothesis (H_0): There is no statistically significant positive relationship existing between the perceived curriculum quality and students' intention to pursue mathematics-based degrees at the tertiary institutions in Jamaica.

Alternate Hypothesis (H_1): There exists a statistically significant positive relationship existing between the perceived curriculum quality and students' intention to pursue mathematics-based degrees at the tertiary institutions in Jamaica.

1.4. Definition of Terms

Curriculum: RI.gov [11] described curriculum is a standards-driven sequence of intentional learning experiences where students develop proficiency in both knowledge and applied skills. It serves as the primary framework for educators as to what is essential for teaching and learning, so that every student has access to challenging and comprehensive academic experiences.

Teaching Methods: The University of Buffalo [12] described teaching methods as the overarching strategies employed to assist students in achieving learning outcomes, while activities are the different ways these methods are put into practice.

Higher Education: Cambridge University Press & Assessment [13] described higher education as studies at a college or university where subjects are analysed at an advanced level.

2. Literature Review

Understanding what motivates students to pursue mathematics at the tertiary level is critical for policymakers, educators, and curriculum designers aiming to increase enrollment and improve outcomes. Research suggests that both the quality of the curriculum and teaching methods strongly shape students' attitudes towards mathematics and impact their future academic path and career aspirations.

2.1. Theoretical Framework

The theoretical framework for this study hinges on the theories Expectancy Value Theory (EVT) and Social Cognitive Learning Theory (SCLT). These theories are relevant in describing the impact of curriculum quality and teaching methods on students' decisions to undertake mathematics-based degrees. They provide insights into what intentions facilitate students to choose mathematics and the influence of teaching environments on their confidence level and beliefs.

2.1.1. Expectancy Value Theory

The Expectancy Value Theory was developed by

Eccles and Wigfield [14] with primary focus on expectancy for success and task value which are two components necessary to guide students choices regarding academic matters. Students have expectations about how well they perform on anything they work on be it academic related or otherwise. These expectations thrive on their beliefs, past experiences, feedback, and their perceived competencies. For example, a student got good grades for his consumer arithmetic test because he comprehends the topic well, and he affirms, “*I can do well at mathematics, I just need to keep focusing and practicing*”. This has allowed this student to desire continuation in learning mathematics. However, another student repeatedly struggles to solve linear equations, no matter how much she tries. Every time any mathematics topic requires solving equations, she hesitates, indicating she has a low expectation that she can do well.

Eccles and Wigfield [14] pointed out that students are not just expectant about the outcome of performing tasks but also place value on these tasks [why engage in these tasks?]. Ref [14,15,16,17] stated that there are four types of task value: attainment value, intrinsic value, utility value, and perceived cost. Barrero-Molina *et al.* [15] explained that attainment value is the personal importance students place on completing tasks well. For instance, some students believed that doing well is part of who they are and hence strive accordingly. Ref [14,15,16,17] explained that intrinsic value, on the other hand, has to do with the joy students obtained from doing tasks. For instance, a student shows appreciation every time she attends mathematics classes because she likes to be challenged and work to overcome challenges. Utility value, according to Ref [14,15,16,17], involves students’ assessment of whether to undertake certain tasks by considering their futuristic impact in terms of their dreams and goals. For example, students who desire to become engineers and lawyers identify the relevance of mathematics to them in terms of whether it will ultimately influence their ability to go into those fields. Ref [14,15,16,17] explained that perceived cost is where students assess their time and opportunities by identifying what sacrifice or commitment is required to complete a task compared to others. For example, a student was given assignments for Mathematics, English, and Social Studies; however, he had to make a judgment call in terms of which to prioritise to do well. In other words, he has to make a trade-off based on what it would cost him to do one over the other.

Barrero-Molina *et al.* [15] emphasized that the EVT theory is most effective when expectancy for success and task value interact, thereby influencing choice behaviour. Hence, the theory guides the predicted outcomes, including students’ levels of engagement, their continued interest, and decisions about their schooling. As such, this theory is very relevant to this study, which explored students’ level of confidence in doing mathematics (expectancy) and their perceptions of the curriculum quality and teaching methods (task value) that influence them in pursuing mathematics-related degrees.

2.1.2. Social Cognitive Learning Theory

The Social Cognitive Learning Theory, however, was proposed by Bandura who focused on social and cognitive

learning [18,19]. The theory emphasized that one’s belief in themselves based on their capabilities to perform tasks well is important and how social interaction guide how they see themselves as well as the impact of environmental factors in shaping their behaviours. Springer [19] shared that in a classroom setting, this involves teacher behaviour in terms of the explanations they provide while teaching, the climate they create, the feedback that they give, as well as observed behaviours of peers. Thus shaping students’ beliefs, confidence, and eventually their learning outcomes. For instance, a mathematics teacher teaching fractions paired the students to use fraction tiles or circles for the lesson. The teacher first showed the students how to use the manipulatives. for example, to show the relationship between $\frac{3}{6}$ and $\frac{1}{2}$, providing clear explanations, asking guided questions, and also allowing questions, as well as providing support as they venture to explore equivalent fractions, similarly, providing corrective feedback. The students would be more likely to participate in this lesson because they develop confidence and have some understanding, and even makes attempt to do independent work since the teacher will scaffold learning. However, students’ confidence level falls when the teacher just puts the fractions on the board and states that they are equivalent without providing clear explanations and examples to drive understanding. This can influence students to become fearful of doing mathematics and lack motivation. As such, this theory indicates that learning is affected by both the curriculum quality and teaching methods utilized in the mathematics classroom, along with environmental factors including the teacher and peer behaviours.

2.2. Curriculum Quality and Relevance

For every course of study programme within any institution, an effective curriculum implementation is crucial to facilitate content preparation and delivery. In essence, educators need to be equipped with quality resources and materials to engage students in the teaching and learning process and the execution of assessment [20]. This will ensure students have the foundational concepts to facilitate creativity, innovation, and human development. This can be reinforced by driving students’ interest and motivation in the mathematics classroom through effective real-world applications and theoretical understanding [21,22]. Moreover, Ball and Freedman [23] have noted that students can benefit from meaningful content and active learning strategies when educators use an inclusive curriculum that encourages students to be more engaged with mathematics and to see its relevance. It, in turn, will facilitate students becoming more likely to consider advanced studies in mathematics-related fields. Similarly, Loucks-Horsley *et al.* [24] pointed out that students need to be engaged with curricula that encourage inquiry and problem-solving skills, while also being facilitated with authentic contexts that support students’ decision or ambition to pursue higher education in STEM fields.

2.3. Teaching Methods and Pedagogical Approaches

Math anxiety is a real, tangible phenomenon that has

strike ongoing discussions worldwide. Presently, many students have expressed feelings of mathematics anxiety across the world. A study conducted by Collins *et al.* [25] at five Jamaican secondary schools in 2022 revealed that students experienced varying levels of anxiety from low to moderate. These anxieties were seen in various forms, including frustration when engaged with new topics, especially when asked to share their understanding using the board, as well as experiencing fear and unease once they attend mathematics classes [25]. This requires teachers to respond to students' individual needs by ensuring that their teaching methods and pedagogical approaches are effective. Additionally, for every class, no single pedagogy can facilitate all students becoming competent as mathematics learners. Thus, this involves teachers being flexible and creative with their content delivery to address students' interests and learning styles [26,27]. To facilitate this, teachers have to consider reviewing their teaching methods and assessing their pace and materials so that struggling learners can excel. Also, research studies, including "Understanding of learning styles and teaching strategies towards improving the teaching and learning of mathematics" by Cardino & Ortega-Dela Cruz [26] have revealed that there is a need for creativity to make learning engaging and meaningful through innovation and real-world applications. Cardino & Ortega-Dela Cruz [26] & Freeman *et al.* [27] revealed from their studies that cooperative learning, inductive approach, deductive approach, and integrative approach were found to have significantly helped in improving students' academic performance as well as increased student motivation and engagement with mathematics content. Furthermore, a renowned comment often stated by students, "I like the class because of the teacher", is ultimately the height of determining students' learning outcome from the very first class, indicating the high expectations of students for teachers to create learning environments suited to them. Furthermore, a meta-analysis study conducted by Freeman *et al.* [27] revealed that students who were engaged with active learning strategies and experienced high academic achievement were often the ones interested in pursuing degrees in mathematics-related fields. Moreover, Hattie [28] reported in a research the need for advocacy for increasing the use of student-centred teaching practices which influence students' understanding of deeper content knowledge and attitudes towards mathematics.

2.4. Attitudes and Social Influences

Studies by Moenikia & Zahed-Babelan [29] & Woon [30] have reported that there is a significant relationship between students' perception towards mathematics and their learning outcomes, such as academic performance and comprehension of content. Many students are of the belief that mathematics is neither necessary nor valuable to them, in school or in their future studies and careers [31]. According to Kyriacou and Goulding [32], one of the significant reasons students chose to discontinue the study of the subject was that they perceived it to be 'boring', 'hard', and 'useless'.

Hyde and Linn [33] found that gender stereotypes and societal beliefs about mathematical ability affect students'

aspirations. Conversely, exposure to positive role models and contextually relevant curricula can mitigate negative stereotypes and foster greater interest [34]. This is particularly relevant in contexts like Jamaica, where students' career choices were influenced by cultural perceptions about STEM. Fraser and Kahle [35] have emphasized that learning environments at home, school, and within peer groups account for a substantial amount of variance in the attitudes of students. They further went on to say that the attitude of the class had a significant impact on the scores achieved by students. According to Rawnsley and Fisher [36], it was found that students exhibited a more favourable attitude towards mathematics when their teacher was regarded as highly supportive.

Suri [8] shared that students continue to struggle with mastering mathematics, mentioning that only 26% of the students at the 12th grade were proficient in mathematics since 2005, based on national assessments. This was further affected by the COVID-19 pandemic, where students' mathematics learning was gravely impacted by the lockdown. These students lacked access to the internet and quiet study areas, which were key to improving their learning outcomes. Suri [8] stated that this prompted several arguments about this, including revamping teaching techniques, returning to more traditional methods, provision of better trained teachers, and changing students' 'fixed mindsets' to 'growth mindsets'. However, Suri [8] stated that none of these considerations have addressed mathematics performance issues. Another point stated by Suri [8] is the low visibility of mathematics. This is influenced by stereotype behaviours such as only geniuses do mathematics, mathematics is irrelevant in the real world, and that mathematics is tough, requiring too much discipline and perseverance.

2.5. Resource Availability and Support Systems

Sirajo & Abdullahi [37] stated that Instructional materials are materials or tools, either locally made or imported, that if used wisely can significantly improve the impact of a lesson and therefore having access to a diverse array of learning resources is essential for effective mathematics instruction, as it fosters an environment that reinforce exploring, unearthing and conquering various concepts of mathematics [38].

Learning mathematics occurs both with analogue and digital resources [39], and as such, access to quality resources, mentorship, and supportive environments influences students' perceptions of their capability to succeed and their motivation to continue in mathematics. By incorporating a variety of resources, educators can design impactful and engaging learning experiences. Williams and Reid [5,6] emphasise that students' motivation is often diminished, as well as portraying negative perceptions due to resource-constrained settings in the teaching and learning process. They explained that this often causes students to see mathematics as difficult and not very accessible.

Across the world, there are universities that faced structural barriers which has impaired how they operate. In the UK, there are several universities whose recruitment budgets have been reduced and experienced

cut-off of other funding [9]. This has affected the quality mathematics education students obtain. Also, comparatively to US and Australia, UK universities offer more specialist degrees instead of allowing students to have a wide selection of courses to choose for more diversity [9]. Quadir [9] shared that there are ongoing discussions of whether to add more mathematics courses in specialized areas such as chemistry, engineering, computer science, economics, and physics to keep specialist mathematicians employed.

2.6. Summary and Gaps

To recap, the literature has revealed that the hindrance to students pursuing degrees in mathematics-related fields is due to the curriculum quality, pedagogical approaches, and teaching methods. It is, however, notable that a gap in the literature referencing Jamaica or even the Caribbean on the topic is lacking. Further research is needed to explore how curriculum enhancements, availability of resources, support systems, and innovative teaching approaches can effectively increase higher education enrolment in the subject, more so, within resource-limited environments such as ours.

3. Methodology

3.1. Research Design

This study leveraged a convergent parallel design, which facilitates a systematic collection of data from a large group, involving between 300 and 500 students. This design enables the concurrent collection of quantitative and qualitative data, but the analyses for each data type are done independently, then integrated to provide comprehensive conclusions. This allowed us to quantify, describe, and provide interpretations of their perceptions and experiences, as well as to establish statistical relationships between variables such as students' perceived curriculum teaching quality and intentions to pursue mathematics-based degrees [40]. Also, it allowed us to garner insights into the quality of mathematics teaching and curriculum at the high school level and their intentions of pursuing mathematics at tertiary institutions in Jamaica. The Expectancy Value Theory informed the quantitative aspects of the study directly, which involves capturing the measurable patterns related to students' confidence in mathematics, their perceptions of curriculum relevance, as well as their decisions to undertake mathematics-related studies. The Social Cognitive Theory, however, not only complemented the Expectancy Value Theory, but provided added value through themes related to teaching interactions, the role of instructional environments as well as feedback in building students' confidence and beliefs.

3.2. Data Collection Instrumentation and Participants

The closed-ended questions mostly focus on the relationship between variables, perceptions (curriculum and teaching quality), and students' behaviours

(willingness to pursue mathematics at the tertiary institutions in Jamaica). The open-ended questions, however, captured students' accounts of teaching quality, content delivery, curriculum relevance, assessment practices, learning experience, motivation to pursue mathematics-related studies, career relevance, and confidence and self-belief. This provided a follow-up to add value to the data collected for more contextualised insights. This enabled comparison between measurable patterns and narrative explanations of students' accounts of their experiences. The students were selected using stratified random sampling targeting students from all three counties of Jamaica, Middlesex, Cornwall, and Surrey to ensure representativeness. Furthermore, within each county, convenient sampling will be used to select the students within each stratum who participated in workshops and competitions (CAPE, CSEC, among others). These students were at least 18 years old from Grades 11-13, and were willing to participate by signing accordingly, reducing ethical barriers. This approach was practical and cost-effective and involved 31 high schools. These students were selected because they are at a critical juncture of deciding whether their future is going to a tertiary institution or not. Also, if they pursue mathematics-related degrees in the event they decide to attend higher-level education, to comprehend their perspectives and enhance mathematics enrollment strategies.

3.3. Data Analysis

For research question 1, descriptive and inferential statistics were used to analyse the data. The study provided the frequency and percentage distribution of students' responses on how confident they feel about their mathematics skills and their level of satisfaction with the mathematics teaching at the high school level. Also, a Chi-square test of independence was considered to determine the relationship between students' perceptions of teaching quality and their confidence levels. A thematic approach was applied to transcribe the responses into recurring themes such as pedagogical interaction, instructional structure, learner engagement experience, assessment orientation, and curriculum framing. These themes were identified and categorized for deeper insights into the numerical data. On the other hand, for research question 2, descriptive and inferential statistics were also used to identify the percentage of students willing to pursue mathematics-related degree programmes, and a Chi-square test of independence to assess the relationship between curriculum enjoyment factors and students' decisions to study mathematics at the tertiary level. Also, thematic analysis was employed to identify recurring themes associated with curriculum, teaching, and tertiary readiness. These themes provided support for a well-rounded interpretation of the study's findings, which aligned with the Social Cognitive Theory.

4. Analysis and Results

This study explored students' views, perceptions, and experiences concerning the impact of the quality of

curriculum and teaching methods on their decision to pursue mathematics-based degrees at the tertiary level. The analysis employed the use of frequencies, means, the Chi-square test, and themes and codes. Furthermore, the findings provided insights into students' ratings of teaching experiences, teachers adopting real-world or practical applications in mathematics lessons, and students expressed a desire for improved mathematics instruction. Moreover, the findings provided an assessment of the statistical significance of the relationship between teaching quality and students' confidence levels in mathematics, to uncover the impact on pursuing mathematics at the tertiary institutions.

4.1. Research Question 1 Results

How do students perceive the quality of mathematics teaching and curriculum at the high school level in Jamaica?

This research question sought to provide a comprehension of students' perceptions of the quality of mathematics teaching and curriculum, which is necessary to uncover the interest level of students in mathematics and their willingness to enroll in mathematics at the tertiary level. This involved examining the experiences of students at the secondary levels, with emphasis on their satisfaction with mathematics instruction and the relevance and innovation of the curriculum. The findings revealed insights surrounding students' mathematics confidence, their attitude towards the subject, and their future plans. However, it is essential to know who the students are in this study, just as much as their perspectives on the quality of mathematics teaching and curriculum. The demographic data shown in Figure 1 revealed that 80.11% of the participants in the study are 18 years old and are currently in Grade 11 (Figure 1). Figure 1 also displays that a smaller fraction of them belong to Grade 12 (19.06%) and Grade 13 (0.83%). The findings revealed that these students are in the final stages of secondary school, where they have already been heavily exposed to the mathematics curriculum. Furthermore, they are at the prime age to form their judgment of their own lives, having the ability to decide about their future, such as what career paths and tertiary education programmes to consider. The Grade 12 and 13 students would have already completed foundational mathematics, Caribbean Secondary Examination Council, or City and Guilds Mathematics. Grade 11 students are prepared to complete theirs by the end of May. However, the small number of Grade 12 and 13 students have been doing CAPE level subjects, of which an even smaller number have been doing Pure Mathematics Units 1 and 2. Additionally, this small number of Grade 12 and 13 students indicates that there is a lower representation of students enrolling in programmes above the Grade 11 level in Jamaica, especially at the sixth form level, to pursue mathematics-based subjects. Even with this, the older students are very valuable in garnering insights into the long-term effects of prior mathematics teaching and curriculum for future tertiary education decisions. Also, students who are at least 18 years old are mature enough cognitively to assert their independence in making their own choices based on their goals and identities as

individuals, especially to influence their viewpoint of mathematics as either a benefit or a barrier. The age and grade level of the students strengthen the reliability of the findings, since they have a lot of years of cumulative mathematics experience. Thus, these students can provide insights into the quality of the curriculum and instructional process to shed light on its impact on enrolment at the tertiary level in mathematics-based degree programmes.

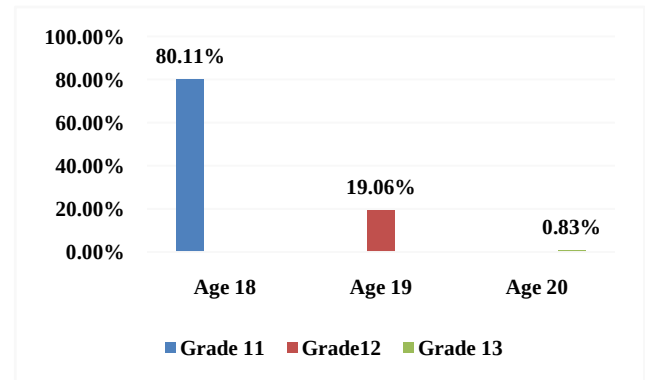


Figure 1. Distribution of students' ages and grades

Furthermore, students were asked about their classroom experiences, and they provided ratings to the Likert scale question about the quality of their mathematics instruction at the secondary school level. Figure 2 provides the perceptions of the quality of teaching as "very satisfactory" (n = 290) or "moderate" (n = 69) by the majority of the students; 3 of them shared it was "not satisfactory", while 72 students expressed that they were unsure. This suggests that the majority of the students find the quality of teaching to be commendable across Jamaican secondary schools, which is very promising for the education system, although Jamaicans tend to associate mathematics with being difficult or causing fear in the learning process. However, it is essential to consider the few students who expressed they were not sure or not satisfied with the mathematics instruction received. The level of uncertainty revealed that there are underlying issues with the quality of teaching, such as inconsistencies, or maybe they have experiences with benchmarks of what good teaching should look or feel like. So, they are equipped to assess classroom experiences, providing their perspectives, and can be transparent about the teaching practices. Furthermore, the students who expressed uncertainty about whether they were actually satisfied seemed to lack confidence in assessing the quality of the mathematics instructions. Further insights revealed that there are inconsistencies in how they were taught, which affected their empowered and engaged in mathematics lessons. They also lacked sufficient exposure to strong instructional practices, indicating that students do not benefit from equal learning opportunities to grasp mathematics concepts. Resulting from this, it can be inferred that there is a direct relationship between students' confidence and engagement levels with teaching methods employed for content delivery. Overall, the findings highlight that even with the complexities of the teaching and learning process, students have a positive view of mathematics teaching. This implies that secondary mathematics teachers deserve to be praised for the work

they are doing in providing students with quality instruction. The study, however, calls for consistency and clarity in using different teaching methods or models to ensure high-quality instruction is provided in all classrooms. The key to this is taking students' feedbacks holistically for reflection in order to improve future classroom experiences.

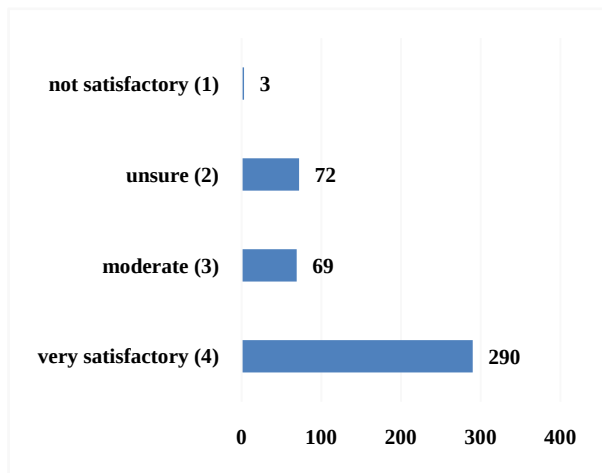


Figure 2. Students' perceptions of the teaching quality of mathematics at their high schools

In addition, Table 1 revealed that 68.22% of the students have an interest in learning mathematics and desire engagement with the content and willing to challenge themselves. This highlights a good foundation that is imperative for learning mathematics, increasing participation and students' future academic endeavours. However, students' interest in the subject must be carefully tied to their confidence level. Moreover, the mean response of students' interest in mathematics is 2.34 indicating that on average students do not believe real-life or practical applications have been beneficial to them. This implies that the students feel disengaged, further conveyed by the "very low" confidence in their mathematics skills revealed by the mean score of 3.0. Contrastingly, even with the mean interest 2.34, the percentage of students who said they were not interested in mathematics is only 0.69% which is very low. This emphasises that there is a need for teachers to modify their teaching methods as previously mentioned to engage students so mathematics is not perceived as a requisite subject in school but providing real world skills development. These skills development include critical thinking and problem-solving which is necessary to deal with daily activities. However, there were other students (32.49%) who were "unsure" if they really liked mathematics to enjoy the use of real-life or practical applications for mathematics lessons. This suggests that these students are not rejecting developing mathematics knowledge but they are not fully there yet to willingly embrace the subject to engage with it. This level of uncertainty was revealed based on the data that it is due to inconsistency with the teaching practices, not having sufficient exposure to the content coupled with their learning styles to ensure they understood the concepts clearly.

Table 1. Frequency of Students' interest in mathematics (1 = Unsure, 2 = No, 3 = Yes)

Item	Unsure (1)	No (2)	Yes (3)
Real-life or practical applications during mathematics lessons	141 (32.49%)	3 (0.69%)	290 (66.82%)

* Mean response of students' interest in mathematics = 2.34; modal response of students' confidence level in their mathematics skills = 3.0

Moreover, this calls for a more targeted educational support to facilitate students with the necessary reinforcement, not just instructional but also emotional. Furthermore, the modal students' interests and confidence level in mathematics were 3 on a 3-point and 5-point scale, respectively (Table 1 and Table 2). This reflects students having an interest in the subject and a moderate confidence level in their capabilities. In addition, confidence and interest usually go hand in hand because students who believe they are capable of understanding mathematics content and completing mathematics tasks often find it interesting, which compels them to persevere despite the challenge. The mean confidence level of 3.15 revealed a neutral stance of being moderately confident, indicating that students experienced moments of clarity and success, but at times though they may feel uncertain or even might have encountered some challenges. This level of confidence, however, is good but needs to be strengthened to reduce or remove the feelings of doubt, especially when things seem to get hard. Also, 66.82% of the students had a moderate confidence rating in themselves, while 15.9% equally shared low or very high confidence (a symmetry), and similarly, there is a balance between the very low and high confidence spectrum (0.69%). This indicates that there are diverse experiences reflected through students' confidence levels are at opposite ends, further compounding that these students may be struggling with mathematics content and assessments, while the same number may excel with ease. This emphasises the need for educators to reframe their instructional strategies, where the struggling students can benefit from scaffolding activities to give them support, while enrichment activities can be leveraged for students who perform well but may not be prepared to deal with more complex mathematics problems. This is necessary to cultivate equitable mathematics instruction across all Jamaican classrooms. Furthermore, it can be reiterated that students' confidence and interest levels are usually aligned, particularly since students are using stimulated cognitively and emotionally in mathematics classrooms, often focusing on what they feel, what they see, and how they respond to this. Therefore, once students realise, they are competent in mathematics or even have moderate capability, they will engage with the subject. Moreover, when teachers emphasise stimulating students in mathematics lessons through differentiated instructions, then students tend to persevere, usually driven by self-belief through difficult moments. On the other hand, it is noteworthy to point out that even though students are driven by their mathematics interest, they need to be confident too to fully engage and pursue it, seeing it more than one of the compulsory subjects that must be done to

graduate high school. This can only be done by reaffirming students in their abilities, coupled with opportunities to engage in meaningful mathematics experiences.

Table 2. Likert scale responses from students about their confidence level in their mathematics skills (1 = Very Low, 2 = Low, 3 = Moderate, 4 = High, 5 = Very High)

Likert scale responses	Very Low (1)	Low (2)	Moderate (3)	High (4)	Very High (5)
Confidence level in your mathematics skills	3 (0.69%)	69 (15.9%)	290 (66.82%)	3 (0.69%)	69 (15.9%)

* Mean response of students' confidence level in their mathematics skills = 3.15; modal response of students' confidence level in their mathematics skills = 3.0

Also, the moderate confidence level of students suggests that there are opportunities for mathematics intervention and encourages their growth by mastering mathematics content. This can help shift the confidence curve and increase the number of students who feel extremely capable in mathematics. Moreover, educators can provide the right teaching moments, using the right examples or even the right word of encouragement to improve the outcomes in mathematics education reform in Jamaica, which calls for strategic, inclusive teaching practices to help move students forward. Also, since students' motivation is already ignited, even if with a low flame, it can become brighter by careful and consistent nurturing to improve their academic stance and increase students' pursuit of mathematics-based degrees at the tertiary level. Moreover, Figure 3 gives a much better insight into all of this through the examination of the relationship of students' mathematics confidence and mathematics instruction. The findings showed that

approximately 90% of the students in the "Very High" confidence category expressed that teaching quality was "Very Satisfactory" or "Moderate", while 80% of the "High" category felt the same. This implies that students are more confident when they benefit from high-quality mathematics instructions [equated effective teaching]. However, there were mixed teaching experiences for students whose confidence level was revealed to be moderate and low confidence, calling for targeted mathematics intervention, which can increase their confidence level and may even enroll at tertiary institutions. In addition, the findings revealed that low teaching quality is strongly related to low confidence, which is likely to negatively affect their decisions to study at the tertiary level.

On the other hand, it is also essential to assess the role of teacher effectiveness, especially to comprehend the factors within the academic scope that affect students' decisions to enroll in mathematics-based degree programmes at the tertiary level. Figure 4 sought to uncover students' perceptions of whether getting a better teacher to deliver the curriculum effectively would influence their decisions to pursue mathematics at tertiary institutions. Sixty-seven percent (67%) of the students (n = 290) expressed "Yes" that having a better teacher is likely to positively impact their choices to pursue mathematics at tertiary institutions. Furthermore, 69 stated "No", and 75 were "Unsure", revealing that not all students believed that mathematics instruction is closely tied to their learning mathematics content. The majority, on the other hand, believed teaching quality has the potential to affect their academic pathways, emphasising that high-quality instruction influences students' immediate learning needs and confidence level in learning mathematics.

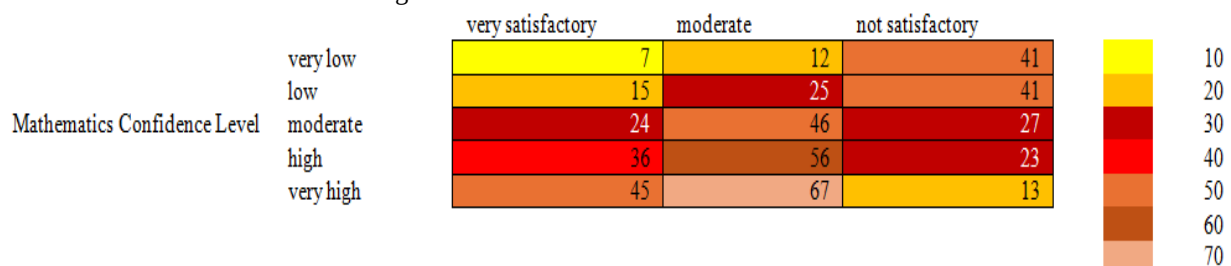


Figure 3. Students' mathematics confidence vs teaching quality

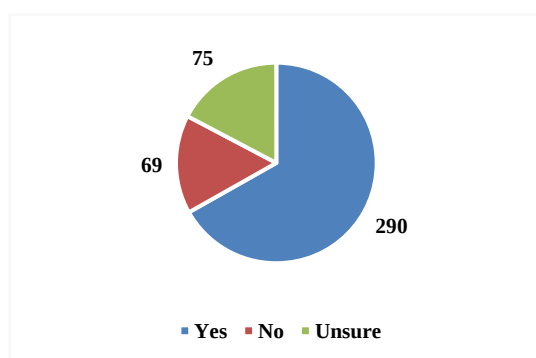


Figure 4. Students' perceptions of whether having a better teacher at the high level imparting the curriculum impacts their decision to pursue higher-level education

Moreover, students do not make their academic decisions in isolation, but rather based on the quality of their school experiences over the years. For instance, the students who prefer better teachers signal that they emphasise the quality of instructional delivery. This indicates that it is more than just them enjoying mathematics classes, but rather them feeling engaged or motivated, having clarity, and even feeling confident to learn mathematics and know what the mathematics field entails in the real world. This suggests that educators are more than just facilitators in the classroom but rather become a catalyst who fuels students' future ambitions, by equipping them with information about career pathways beyond the regular expectations, such as lawyers or doctors. Also, what is striking about this is that these students shared moderate to high interest and confidence

in mathematics, but they consider the quality of teaching an assurance for learning and supporting their growth to decide on their future academic and career choices. Therefore, for students, it is more than just teachers guiding students through the syllabus and preparing for examinations such as CSEC and CAPE, but being able to identify routes they can take by having options to choose from. The students who shared they were unsure may have had teachers who were not inspiring, even though their mathematics instruction was adequate but did not feel like they experienced effective teaching.

This indifference revealed that greater clarity may be needed in their classroom experiences, coupled with mentorship and consistency. This will help students benefit from opportunities where they feel some sense of connection, engagement, or even being encouraged. Now, for the minority ($n = 69$), they might have already decided on mathematics, for better or worse. It implies that some of these students might have already identified alternative academic and career pathways, so not even the most effective teaching strategies would affect their interest in choosing mathematics-based degrees. This further implies that students may have early experiences where they have already decided not to continue mathematics beyond high school, even with the excellent mathematics instruments, before reaching Grades 11, 12, and 13. Educators need to consider other factors to make students aware of mathematics fields and offerings aligned at tertiary institutions during students' early years, providing them with repeated exposure as well as mentorship based on teacher-student relationships, so they have a fair chance of all the possibilities that exist.

Additionally, the heatmap in Figure 5 revealed the correlation between students' satisfaction with teaching quality and their desire for improved teachers. This relationship was found not to be mutually exclusive since about 89% of the students expressed that they were very satisfied with mathematics instruction, but they still expressed that if they had better teachers, they might consider mathematics-based degrees at tertiary institutions. This suggests that the students are thinking beyond comfort and familiarity, desiring a shift in classroom

culture. This may be because they want something more that can help them to prepare for their future studies and career pathways. However, 23 of them, although they were very satisfied with mathematics instruction, stated that having better teachers would not help them pursue mathematics-based degrees.

Nonetheless, even with students mostly being satisfied with the teaching quality of mathematics they still desire more clarity in the instruction so they can better know its relevance and challenge themselves. In other words, they want a more meaningful impact when they participate in the teaching and learning process. The findings suggest that students can assess their learning experiences to identify the strengths and weaknesses, indicating that teaching is multi-dimensional. This is further compounded based on 73 students stated they experienced moderate satisfaction but almost unanimously agreeing that the teaching and learning experience can be better.

Conversely, 96% felt dissatisfaction with the quality of the teaching instruction. Resoundingly, almost every student is asking for improvements in the delivery of mathematics instruction. This calls for proactive measures to be established instead of just them being reactive for a better instructional experience. One main point noted by these students is that they feel motivated in mathematics lessons and engaged but do not find themselves to be a struggling learner even with the challenges. This also serves as a reminder that while the teaching quality is appreciated, it should not be static. For these students, it is more than just passing their CSEC and CAPE mathematics examinations; they want more in terms of comprehending and applying mathematics skills to succeed beyond the classroom, and based on the high quality of teaching, they believe their teachers are capable of rising to the occasion. Overall, this points to room for growth and enhancement of mathematics delivery in the Jamaican high schools. This will provide opportunities to reimagine mathematics classrooms, facilitating a community effort by partnering with students, making it more than just instruction, but feeling like the students and teachers have shared ambitions.

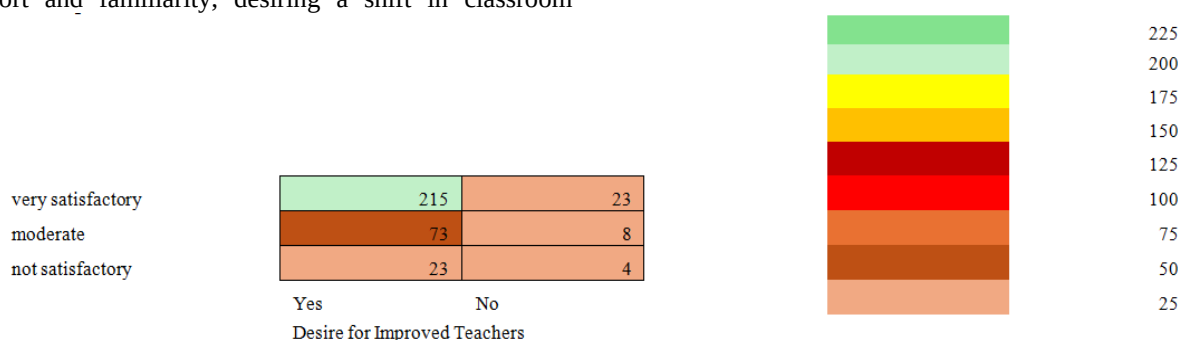


Figure 5. Students' perceptions of teaching satisfaction compared with their desire for improved teachers

Table 3 complements the quantitative findings stated above to uncover deeper insights into students' shared experiences. It presents themes that emphasize the specific areas of curriculum and instruction that impact students' perceptions. Two students give their accounts about pedagogical interaction, which is tied to Figures 2 and 3. The quantitative findings above revealed that most students were very satisfied with teaching quality and felt

confident, which was in line with one respondent who stated that the "teacher explains well" (Table 3). This suggests that this student found the teacher to be responsive, providing clear explanations and feedback. Such classroom interaction is closely tied to students' moderate confidence levels reported in Table 2, indicating students had a sense of understanding of mathematics concepts. However, another student pointed out "students'

fear that they don't understand". Even though it is just one person sharing this statement, it seems that it resonates not just with that individual but his or her peers in the class as well. The statement reflects that there is an underlying persistent sense of self-doubt or uncertainty in doing and understanding mathematics concepts. This has caused the student to be anxious whenever they feel like he or she is not grasping the concept, which may be due to a lack of prior knowledge or struggling to keep up. So, this student may need reassurance to advance in the learning process, which might be a call for improved teaching as shared in Figure 5.

Table 3. Themes related to students' perceptions of mathematics teaching and curriculum quality

Themes	Indicators	Frequency
Pedagogical interaction	Students fear that they don't understand; teacher explains well	2
Instructional structure	teach math needs patience; my teacher spends time organizing lessons and delivery is fluent.	2
Learner engagement experience	I just love math, its challenging but I love it; Math is fun; Math sucks	3
Assessment orientation	a single exam should not be the defining factor of a persons aptitude for mathematics. This can cause doubt and discourage many from pursuing the discipline; focus is mostly on exam preparation	2
Curriculum framing	The influence of STEM needs to be perpetuated by introducing the importance and necessity of it; not knowing how it can be applied in the real world.	2

The second theme, instructional structure, reflects students' contrasting accounts. One student stated, "My teacher spends time organizing lessons and delivery is fluent." This indicates that his or her mathematics teacher spent time to bring value to the content delivery, highlighting that he or she benefited from the pace and sequencing of the lessons. This is aligned to Table 2, where students expressed having a sense of moderate confidence in mathematics. Conversely, another student mentioned that "teach[ing] math needs patience". This signals that this student believed his or her teacher was progressing with the lessons too quickly, thereby not giving him or her enough time to process and engage with the concepts. This indicates why not all students have high confidence in mathematics, as shown in Figure 3. This also may be connected to Figure 1, where most students are in Grade 11, where the curriculum intensifies as they prepare for their CSEC exams. Thus, the teachers prioritise preparing students for the exam, focusing on covering sufficient topics instead of consolidating the information into bite size for students to adequately assimilate into their schema.

Two students shared their thoughts on curriculum framing, referring to how they the content was contextualized by their teacher(s). The theme is closely aligned to the findings in Table 1 in relation to real-world applications in classroom. One student reported that, "The influence of STEM needs to be perpetuated by introducing the importance and necessity of it." This indicates the need for students to be provided with more deliberate reinforcement of the relevance of STEM, particularly

mathematics by exposing them to clear, contextualized, meaningful explanations of real-world applications. This should be done by providing connection to everyday living examples, societal development, and career opportunities to grasp the fundamental nature of STEM. Also, it is a call for concrete explanations and not just the abstractness of mathematics, more geared towards passing exams but opportunities to understand the value to societies and themselves, especially for their future.

Another theme is assessment orientation, which includes identifying whether the present assessment design is agreeable to students. Two students echoed that exam preparation has been the focus of mathematics, which further indicates the wide-scale moderate confidence of students. One student shared, "A single exam should not be the defining factor of a person's aptitude for mathematics. This can cause doubt and discourage many from pursuing the discipline." This implies that the student believed too much emphasis is placed on high-stakes examinations such as CSEC and CAPE mathematics to assess students' mathematical ability. This single exam is considered not to be enough to accurately examine their understanding of concepts, reasoning skills, level of growth, or even their potential. Additionally, the student indicated that the consequences can be dire for them emotionally and psychologically based on the grading/ assessment systems. In other words, for some students who perform poorly on the exam, they may erode their confidence by self-doubting, even if they have strong problem-solving skills and can improve eventually, leaving them to believe they are just not good at doing mathematics. This reflects the advocate for sticking to the meaning of learning, that it is a lifelong process instead of a single outcome determined by a test, influencing students' interaction with mathematics in the future. Focusing on exam preparation leaves little to no room for conceptual exploration, which may require real-world applications, as indicated in Table 1, which is also reflected in Figure 5 – the need for instructional improvement.

The final theme, learner engagement experience, is directly tied to students' interest and confidence. Two students stated that they enjoyed learning mathematics. One of which expressed that, "I just love math, its challenging but I love it", indicating that he or she did not see this challenge as a deterrent from engaging with mathematics. This student believes that efforts are needed to understand and reason the mathematics, and once he or she puts in the work to solve mathematics problems or seek to comprehend abstract concepts he or she feels accomplished. This implies that this student has a growth mindset not desiring to remain at the same place but going towards what they desire be it learning or personal development and not giving up. Generally, students of this nature tend to seek more knowledge of mathematics complex and are likely to pursue mathematics-related careers or advanced their academic studies. Contrastingly, one student stated "Math sucks", implying that this student might have experienced a recurrent pattern of frustration in the classroom, not feeling engaged or even finding mathematics difficult regardless of what he or she does. Essentially, this student seems very dissatisfied with his or her learning experience which might have been

influenced by assessment designs, lack of meaningful connection to real-world applications or even unclear instructions. This has caused avoidance or resignation, implying the student just want to done away with mathematics for good. This type of response reflects students may have low confidence and motivation calling for engagement, support and exposure that provides them with opportunities to see the value of mathematics.

Overall, the study revealed that there are inconsistencies across the themes indicating just like the quantitative findings that alignment of pedagogical practices, students' learning expectations and needs is necessary to consider career pathways.

4.2. Research Question 2 Results

To what extent does perceived curriculum quality influence students' intentions to pursue mathematics-based degrees at the tertiary institutions in Jamaica?

Behind every decision to pursue mathematics-based fields at the tertiary level or identify other programmes of study, this research question sought to explore the degree to which students' perceptions of curriculum affect their decisions to pursue mathematics-based degrees at the tertiary institutions. By knowing this, one will be able to uncover the enrollment patterns across tertiary institutions. Furthermore, through students' responses, the findings will reveal how students view the relevance of the mathematics curriculum, their experiences with classroom engagement, and exposure to real mathematics applications. These accounts will indicate the future direction of the students in terms of their studies and career goals.

Based on the data, 67% of the students expressed that they have a desire to pursue mathematics-related studies at the tertiary level, while 17% were unsure and 16% said definitely not (Figure 6). When the number of students (114) who hesitated or seemed uncertain is combined with those who lacked interest in pursuing mathematics-related programmes beyond high school, it indicates their lack of enthusiasm to engage with mathematics content. It, however, suggests the need for reflection and intervention, particularly for students who are uncertain of their interest in mathematics. This uncertainty may be caused by several reasons, such as a lack of exposure to mathematics-based career pathways, occasional confusion in class, or inconsistency with how the subject was presented to the students, especially in providing experiences with real-world applications. This decision implies that students can be influenced, given the support they may need through education and relational opportunities, which include mentorship, and providing role models, as well as identifying the link between mathematics and their future pathways [including personal interests]. Furthermore, the students who said "No" when asked about pursuing these degrees seemed to have a long-standing discomfort with mathematics, might have found it challenging, or may even prefer other disciplines. This implies that some students may see themselves as "not mathematics persons", while others might have experienced disengagement, and/or frustration. So, to them, mathematics education needs to be more than teachers trying to get students to master content; rather,

dismantle the stereotypes associated with the subject. These students might feel that they cannot succeed or are not academically ready to pursue these degrees, which can cause them to change their ambitions. Additionally, for them, the following are usually important: accessibility of the mathematics curriculum, the learning environment, and being able to relate to the teaching process. Therefore, knowing why students seem unsure or unwilling is important to address by turning these negative perceptions into confidence. This involves letting them feel trust in doing the subject and helping students to feel ready about selecting and pursuing mathematics-based degrees, starting with them believing in their abilities.

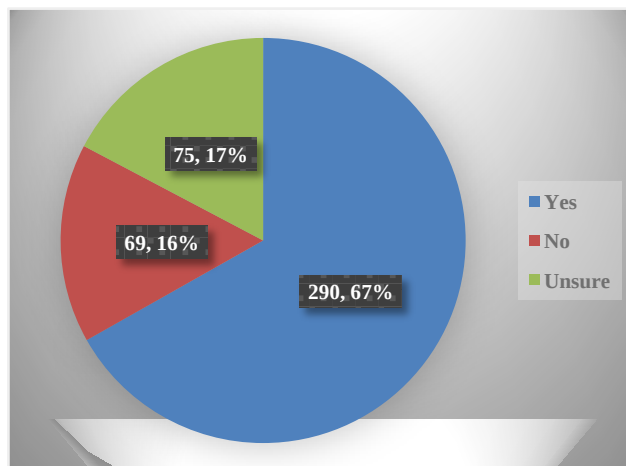


Figure 6. Students' decision to pursue a mathematical-based degree

For a deeper insight, students were asked what they enjoyed the most about learning mathematics, not just for academic reasons but also for personal reasons. Figure 7 illustrates that 290 students enjoyed mathematics once the content allowed them to engage in logical reasoning and real applications. The other students, though small in numbers, preferred the more traditional pathways, including working with numbers (69) and being able to problem solve (3). This all goes back to students wanting to know the relevance of mathematics to them to facilitate engagement, instead of the traditional rote calculations and striving for high academic performance. Additionally, the students want to be engaged with mathematics to know how the world works mathematically. This implies students have developed an appreciation for mathematics to not just learn about the structures and language of mathematics but rather applying logical reasoning integrated with real-world examples. This they believe should constitute of opportunities to discuss their ideas about mathematics, explain their understanding of the concepts and be able to eventually make their own decisions about mathematics inside and outside the classroom. This can help students to become independent thinkers rather than slates for teachers to write on, especially in the real world and career pathways [STEM-related or otherwise].

Additionally, students appeal to teachers to incorporate real-world applications or practical examples, which is more than knowing and using abstract formulae, but understanding how mathematics works in their day-to-day operations, particularly in areas such as digital technology, budgeting, health, or engineering. This typically creates a

shift from mathematics being considered a compulsory subject in high school to a life skill, because students can see its purpose and may engage with mathematics and persevere. Meanwhile, students shared that themes including “working with numbers” and “problem-solving” no longer resonate by themselves but rather consider them as mathematics tools to use for a wider scope as it relates to logic and application.

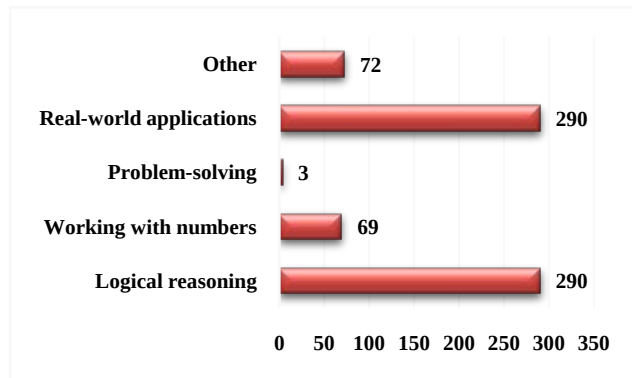


Figure 7. Students' responses to what they enjoy the most about mathematics

This implies that students have become more desirous of the cognitive and practical attainments of mathematics beyond its routine operations. Furthermore, the group that identified they enjoyed mathematics for other reasons reflects diverse experiences which may be attributed to emotional engagement, desiring to be creative, or even for collaboration, which is outside the scope of the traditional frameworks to facilitate inclusivity and drive motivation. These are things a test or textbook typically does not capture or account for, where they may enjoy feeling empowered, capable, or connected to something outside the traditional domain. In other words, students today want to have experiences that affirm them personally and challenge them intellectually, being curious about a curriculum that shows them the realities of the world, especially the complexities in their daily lives.

Furthermore, there are discussions about the relationship between the role of curriculum and students' interests in mathematics and its' impact on students' decision-making processes. Table 4 displays the qualitative responses shared by fifteen students (3.46%) reflecting their interest levels in pursuing mathematics-

based degrees. These accounts shed light on why students may feel that the current curriculum has failed to deliver. Most of the shared comments displayed disinterest in pursuing mathematics-based degrees due to issues including perceived irrelevance, a lack of clear real-world applications, and mathematics instruction that mostly focuses on a single high-stakes exam. They desire to have experiences that demonstrate why they need mathematics that they can relate to, find practical, and are likely to shape their futures. A student expressed that learning mathematics is a “waste of time” because he or she is unconvinced of its relevance to them. This is closely tied to the themes indicated of what students mostly enjoy about mathematics, of which logic and applications are the most valued, but need to be tangible enough for students to feel like their expectations are being met. This might be due to a gap between curriculum content and curriculum communication, so that students can experience practical applications that are visible or memorable, and contextualised.

On the other hand, another student expressed that the mathematics curriculum in Jamaica needs to be more than being predominantly focused on high-stakes examinations, such as CSEC and CAPE, which he or she feels is more transactional instead of transformational. Furthermore, this undermines students' confidence and willingness to pursue mathematics-based degrees, because many students may feel stripped of enjoying mathematics through a sense of discovery to explore concepts rather than constantly focusing on preparing for high-stakes tests. These tests typically indicate that students should spend time practicing and knowing the right answers, which is important to pass the tests, but they might unintentionally believe the system failed to let them know why or how all this is relevant. These can leave students feeling unfulfilled, especially if the curriculum is not making them feel ready for future endeavours. Additionally, students want to see themselves in the mathematics curriculum material, where they can have experiences that indicate the societal challenges being experienced, and aligned to their dreams and goals, including their careers. Also, students need to have reasons to see mathematics-based degrees as viable career options or a fulfilling pathway. Moreover, Figure 3 hinges on three main themes: teaching, curriculum, and tertiary readiness, for more key insights.

Table 4. Students' perceptions on pursuing mathematics at the tertiary level

Themes	Indicators	Frequency
Curriculum	Math sucks; the influence of STEM needs to be perpetuated by introducing the importance and necessity of it; students fear that they don't understand, teach math needs patience; I believe that a single exam should not be the defining factor of a person's aptitude for mathematics; My dislike for math stems from a place of not knowing how it can be applied in the real world. I am often told of general application areas but nothing specific so it feels like a waste of time; Math is fun.	5
Teaching	I needed good math teachers to have better attitudes and skills; I would never pursue math; the influence of STEM needs to be perpetuated by introducing the importance and necessity of it; students fear that they don't understand, teach math needs patience; I believe that a single exam should not be the defining factor of a person's aptitude for mathematics; my mathematics teachers have been and are great; The better a teacher is at teaching the subject, the better students are able to enjoy and properly learn the subject; my teacher teaches very well, I personally think the challenge is with me to be honest, hence I try to study more; even though I had a great math teacher I would not pursue it as a career.	7
Tertiary Readiness	Math sucks; needed good math teachers to have better attitude and skills; I would never pursue math; I believe that a single exam should not be the defining factor of a person's aptitude for mathematics; I just love math/Pure math, it's challenging and I love a good challenge; It's not my passion; my teacher teaches very well, I personally think the challenge is with me to be honest, hence I try to study more; even though I had a great math teacher I would not pursue it as a career; I have done Pure Math unit I and now pursuing Pure Math unit II; I dislike maths a lot and so I don't want to pursue this subject as a career.	8

Repeatedly, the students have shared that teaching quality is the main driver of students being engaged and disengaged, where most students equate better teaching to them having better skills and confidence to master content. In terms of curriculum, however, students have emphasised that mathematics instruction needs relevance instead of struggling to motivate themselves to pass the high-stakes tests. Students have resoundingly stated they might not pursue mathematics-based degrees, even though most benefit from good teaching and like mathematics, because they lack passion and confidence, and also cannot feel a connection to mathematics or understand its value to them. This is particularly because curriculum quality alone is not the sole determining factor of students' decision to pursue mathematics-related programmes at the tertiary level, though substantive. This indicates that the curriculum needs to be more inviting, relevant, and open to possibilities for the students, who are the storytellers of their learning. So, a secondary school's curriculum reformation can involve innovative instructional practices, logic, and real-world integration, and authentic problem-solving.

Moreover, an insight into the statistical significance of students' confidence in teaching quality and mathematics instructions using a Chi-square test is relevant to make the connection between Table 4 and Table 5. The result of the test revealed this relationship to be statistically significant ($\chi^2 = 87.13$, $p < 0.001$), indicating that teaching quality directly influences students' mathematics confidence levels. This test notes that for the majority of students, high-quality teaching is more likely to influence higher confidence in students' mathematics abilities, which is more than the anecdotal comments shared, since it is measurable trend. Additionally, the test reinforces that high-quality teaching can do more than transmit knowledge; it has the potential to help students engage with complex material, overcome difficulties faced, and grow as individuals. Students are desirous of having teachers who can respond to their individual needs through mathematics teaching [connecting content to their lives and goals], making them feel encouraged to be confident, to persevere, take risks, and eventually decide about their personal goals and futures, including whether to pursue mathematics-based degrees or not. Also, this test is a call to action, encouraging educators and curriculum developers to consider students' confidence to shape their skills in the classroom and explore mathematics concepts more deeply. Table 5 reinforces that good teachers matter just as much as content mastery, but more importantly, how students perceive themselves concerning mathematics. Also, Table 6 uncovered that no statistically significant relationship exists between mathematics confidence and teaching satisfaction levels, and desire for improved teachers ($\chi^2 = 0.71$, $p = 0.6997 > 0.001$). This implies that regardless of students' level of satisfaction, they are calling for improved teaching.

Table 5. Chi-square test of independence of mathematics confidence and teaching quality

Chi-square statistic	87.13
Degrees of freedom (df)	8
p-value	0.0000
Significance at 5% level	Yes

Table 6. Chi-square test of independence of teaching satisfaction and desire for improved teachers

Chi-square statistic	0.71
Degrees of freedom (df)	2
p-value	0.6997
Significance at 5% level	No

This was further compounded by the conducted Chi-square test of independence and binary logistic regression, as illustrated in Tables 7 and 8. Table 7 provides insights into the relationship between students' perception of teaching quality and their decision to pursue mathematics-based degrees. This association was found to have a high statistically significant ($\chi^2 = 79.45$, $p < 0.001$). Furthermore, the effect size from the test is 0.43 indicating that a moderate to strong relationship exist, implying that who believe in effective mathematics instruction and delivery that pique their interest are highly more likely to pursue mathematics-related degrees. This strength emphasises that students confidence in their academic subjects pursuits is closely tied to their long-term decisions of their field of choice, which is usually affected by teacher effectiveness and curriculum engagement.

Table 7. Chi-square test of independence of the relationship between students' perception of teaching quality and their decision to pursue mathematics-based degrees

Chi-square statistic	79.45
Degrees of freedom (df)	1
Effect size	0.43
Significance at 5% level	Yes

However, to estimate the magnitude of this influence, the binary logistic regression was carried out, revealing that students believed that better curriculum teaching quality increases their likelihood of pursuing mathematics-based degrees at the tertiary level ($OR = 14.2$, 95% $CI [8.3, 24.2]$, $p < 0.001$). This indicates that students are 14 times more likely to strive for mathematics-related programmes at the tertiary level as opposed to those who expressed they would not, based on their positive perception of the quality of teaching the curriculum. This suggests that students' beliefs about teaching effectiveness at the secondary level act as a powerful predictor for students' enrolment in mathematics-based degrees. This indicates that the quality of instruction is crucial for determining students' decision to pursue mathematics-based degrees or not. Thus, students' confidence and curiosity of mathematics when developed using innovative teaching strategies can influence these decisions.

Table 8. Binary logistic regression of the association between students' perception of teaching quality and their decision to pursue mathematics-based degrees

Odds Ratio (OR)	14.2
95% confidence interval	[8.3, 24.2]

4.3. Further Discussions and Implications

The study revealed that students' attitudes towards learning mathematics and decisions concerning their pursuit mathematics-related studies are significantly affected by the key factors of students' readiness, and the

curriculum quality and relevance in Jamaica. This is reinforced by the Expectancy Value Theory, which infers that students' attitudes are shaped by their beliefs and values associated with mathematics [14]. The students are at a crucial point in deciding their future academic and career endeavours. They expressed that even though the mathematics instruction they received is adequate, they want exposure to contextualised real applications for their day-to-day activities. However, some students were unsure about pursuing careers in mathematics-based fields, which may be due to the inconsistencies in the content delivery across secondary schools based on differing curriculum materials and teaching methods. Gersham et al. [41] explained that students' tend to have mixed perspectives mainly stemming from long-term effects of early mathematics, depending on their belief of content delivery, which often affects their academic choices by Grade 11. Ref [29,31] stated that students' interaction with mathematics today are based on whether they perceived prior learning experiences to be meaningful and beneficial to them. In other words, students want to know that learning mathematics is useful to them for their current and future goals as well as being able to achieve good or even excellent scores. Furthermore, their responses paint a complex picture; where most students felt satisfied with the teaching quality, believing that it is enough, but at the same time they see room for improvement. They see the need for improvement in differentiated instruction, increased engagement, support, and classroom experiences that align with their personal goals. This call by the students, the EVT theory indicates if not will encourage students increased perception that they are more likely to succeed in mathematics. Patterson and Tytler [42] added that students need more than just effective mathematics teaching; they are curious about how math explains the world, emphasising the importance of applying theory to practice, fostering conceptual understanding rather than just content delivery. This is echoed by Ref [3,10] who shared that teachers need to consider curriculum innovation that facilitates students' engagement with more mathematics applications that they can identify with based on their everyday life. The vast number of students ($n = 290$) stated that they might have considered pursuing mathematics-based programmes if they had better teachers, suggesting that students desire teaching approaches to be transformed. This is consistent with Ball and Freedman's [22] who stated that there is more to the curriculum to drive impact where classrooms are more engaging to encourage interaction with mathematics content beyond traditional methods. This would influence students to become risk-takers where they can make mistakes and improve as they learn from them, rather than constantly focusing on trying to get the right answers, bridging the gap between theory and practical, authentic examples involving problem-solving. Students expressed that for them, curriculum quality is important, as it enables them to enjoy logical reasoning and real-life application. These were further emphasised by the qualitative responses, which call for curriculum relevance, more than just exam-driven instruction, and being more specific to include their career pathways and personal goals. Based on the theme, assessment orientation, through the EVT and SCLT, educators and school

administrators are being implored that high-stake examinations are undermining students' capability in terms of true achievement and their value. This, Brown et al. [31] is necessary to reduce students discontinuing mathematics very early due to the devastating impact on their emotions and psychology. Freeman et al. [27] and Golding & Kyriacou [32] stated that while assessments are necessary, there is need to make the practices associated more balanced by focusing on both conceptual understanding and procedural correctness.

The National Academy of Sciences [43] highlighted that the subject needs more context for students to provide interdisciplinary and purpose-driven learning experiences. In other words, the emotional side is not catered to as much as the cognitive side of students through the current curriculum, which can alienate students from having the capability to advance their studies based on their aptitude and interest. The qualitative perspectives are strengthened by the statistical analyses, such as the Chi-square test, which confirmed a strong positive relationship between students' confidence levels and mathematics instruction. This relationship from an EVT perspective is considered to be influenced by classroom experiences. Beilock et al. [44] postulated that these may be due to teacher-related issues such as anxiety and instructional effectiveness, which typically affect students' attitudes and performance, particularly those who are vulnerable. On the other hand, there was no relationship between students' satisfaction with teaching quality and desire for improved teaching beyond students' performance. Even though most of the students shared that they are interested in doing mathematics beyond high school, the minority who selected unsure signals the need for continuous intervention. Kershner [45] argued that students can be engaged through sustained outreach initiatives such as competitions, mentorship, and workshops [external enablers] to reinforce the value of mathematics, especially to strengthen students' confidence where traditional classroom instruction falls short. This was also strongly endorsed through the Social Cognitive Learning Theory calling for social environments to become more active to give students support to better become acquainted with the relevance of mathematics [18]. This Bijandi & Nabavi [18] stated when coupled with instructional practices have the potential to shape students beliefs and learning behaviours about mathematics. Table 9 also adds to this perspective, where the students expressed participating in outreach activities (66.82%) and school influence (66.82%), including their teachers and guidance counsellors, have been the greatest accounting factors. Students shared that teachers and guidance counsellors provide advice, support, and encouragement, which are likely to increase their chances of enrolling at a tertiary institution. This Fraser and Kahle [35] and Fisher and Rawnsley [36] echoed stating that teacher-student relationship is important along with the instructional clarity and feedback teachers provide, which are key to enhance student confidence and engagement. This is because students can better understand their current experiences and future aspirations to make the best decisions concerning their futures. Students have also shared outreach activities by tertiary institutions, including mathematics competitions, CAPE and CSEC workshops, and STEM initiatives have helped

them experience mathematics in a different light. They have visualised the connection between mathematics and real-world applications, which is more tangible, especially since they stated that they valued logic and application-based learning. Contrastingly, parental influence (15.91%) and awareness of career opportunities (15.91%) were perceived to be less influential than outreach activities and school influence, revealing that only a small number of students get career advice from family members and career education, particularly about mathematics fields. This has likely impacted their decision to pursue mathematics-based programmes. The findings implied that increasing mathematics enrollment at the tertiary level is more than simple classroom practices but rather a system approach which involves especially clear strategies. Archer et al [33] and Kershner [45] inferred that even though outreach activities and school influence are the main drivers, it is important to be more intense by encouraging role models and instituting opportunities where students know the in-depth relevance of mathematics especially in terms of future pathways from an early age. This EVT and SCLT perspectives indicate with fortify students' utility value and drive greater motivation. Also, it appears that scholarship initiatives (0.69%) do not affect their knowledge much either, which may mean that they are unaware of these opportunities for mathematics-related degrees or might not see these initiatives as motivation. Therefore, tertiary institutions and policymakers in Jamaica need to make scholarship offerings more visible to students in high school to recruit them, especially the underrepresented or undecided students. The findings further emphasise the need for a holistic approach which constitutes reshaping the mathematics education. This should facilitate dynamic students' development that is meaningful with not only a focus on what is happening in the classroom but preparing them for the real-world. This would need innovative strategies for curriculum, incorporating student-centred approach, and continued teacher development that is sustained. Essentially, these must be tied national educational and students goals. According to Doe and Smith [46] education systems should only make reformations by engaging in continuous research and assessing educational strategies. This needs to be done by collecting and using empirical data based on students' perspectives to identify targeted intervention plans that are both inclusive and equitable. In doing so, it should also include career fairs that provide exposures to various fields that are mathematics-based to drive the enrolment numbers at the tertiary level. Ref [24,26] also emphasized that this is an integrative process where professional development for teachers and curriculum transformation must also be part of the reformation process. Additionally, teachers' beliefs about mathematics must be part of this reformation. The teaching of mathematics need to be driven by pedagogical strategies that encourage more student interaction by the improvement of teacher-student relationships, contextualizing mathematics making it more meaningful, and include more scaffolding learning.

Table 9. External enablers as influencing factors for students to pursue mathematics-based degrees

Influencing factors	Percentage
School influence (teachers/ guidance counsellors)	66.82%
Outreach participation	66.82%
Parental influence	15.91%
Career opportunities in mathematics	15.91%
Scholarship availability	0.69%

4.4. Conclusion

The findings of the study revealed that majority of the students who were willing to pursue mathematics-related careers are the ones interested in engaging with mathematics content that allow them to think critically and logically as well as applications in the real world. They seemingly are the ones who are also pleading that the gap existing between curriculum relevance and delivery be bridged strategically by employing enhanced instructional methods. This will require a long-term, flexible multi-faceted approach by the Jamaican secondary school system to drive initiatives that improves student enrolment at the tertiary level. This approach will need to constitute measures that strengthen students' capabilities and confidence in engaging with mathematics. Moreover, this should be closely tied to reinforcing their cognitive and emotional abilities, by considering their personal goals and beliefs and guide them accordingly. In concluding, students can feel like they have reached a goal by learning mathematics, which can translate to inspiration to pursue mathematics-based degree programmes.

ACKNOWLEDGEMENTS

The authors would like to express their gratitude to the students' and teachers who were willing to participate in this study.

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