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A Machine Learning–Enhanced Qualitative Investigation of Determinants of First-Class Honours Achievement in Mathematics

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Abstract
This qualitative study explores the factors influencing the attainment of first-class honours in mathematics among graduates from the Department of Mathematics at Ignatius Ajuru University of Education in Port Harcourt. Utilizing a purposive sampling technique, five graduates who achieved first-class honours were selected for in-depth interviews. A researcher-designed 20-item interview schedule was employed, with questions organized to address specific research objectives related to motivations, study strategies, significant influences, perceived impacts, and advice for aspiring students. Data collection involved recorded interviews, which were transcribed and analyzed using a thematic analysis approach. Key themes emerged that highlighted the interplay of personal motivation, effective study practices, supportive academic environments, and the impact of achieving first-class honours on future aspirations. Ethical guidelines were strictly adhered to, ensuring confidentiality and informed consent. The findings among others established that graduates expressed a strong internal drive to excel in mathematics, often rooted in a passion for the subject and personal ambition, they employed diverse study strategies, including structured study schedules, active engagement with course materials, and collaborative learning with peers. These strategies facilitated a deeper understanding of complex mathematical concepts, and the presence of mentors and supportive faculty members played a vital role in the academic journeys of the graduates, the graduates highlighted life experiences, such as overcoming personal challenges or participating in extracurricular activities, as influential in shaping their academic identities and resilience, and achieving first-class honours positively influenced participants' perceptions of their capabilities and future career opportunities, enhancing their confidence in pursuing advanced studies or professional roles in mathematics-related fields. Based on these findings, it is recommended that universities should implement structured mentoring programs that connect high-achieving students with faculty members and industry professionals. Such programs can provide guidance, support, and resources, further nurturing students' intrinsic motivation and helping them develop effective study strategies essential for academic success in mathematics.

Keywords: First-Class Honours, Mathematics Education, Academic Achievement, Qualitative Research, Factors Influencing Success

Introduction

Students who distinguished themselves in academic work are classified topmost and awarded the first-class honours. This is the highest level of honor a student can acquire at the undergraduate level. It is the hallmark of academic excellence that is achieved through calculated discipline, dedication, commitment and an unwavering determination to making a positive difference among peers and course mates at the first-degree level. Such coveted crown that majority of the students yearn for are restricted to only those who are willing to pay the price of engaging in extra study through resilience and proper time management. Most employers in organizations often desire to engage these group of achievers to join their work force in order to tap into their enviable mental capacity for productivity and growth of their industries. According to Uzor (2024), first-class graduates are evenly sought after by employers of various industries and disciplines. Therefore, it is the desire of most students to attain this feat which will enable them

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to not only be honored but also have a quicker placement in the labour market. More so, it paves the way for such students who aspire to pursue postgraduate studies anywhere in the world even into prestigious universities through grants, scholarships and other forms of sponsorship to be admitted easily.

Achieving first-class honours in mathematics represents an exceptional level of academic success and commitment. This distinction reflects not only a deep understanding of complex mathematical concepts but also a high degree of discipline, strategic learning, and intrinsic motivation. As educational institutions strive to foster environments that promote academic excellence, understanding the factors that influence students to attain the highest honours in challenging fields like mathematics becomes essential. This literature review explores the multifaceted factors that contribute to first-class academic performance in mathematics, including motivation, study strategies, influences of mentors and experiences contributing to success, perceived impact of achieving first-class honours, and advice for aspiring students.

Motivation, both intrinsic and extrinsic, serves as a foundational driver for students' academic success in mathematics. Research emphasizes that intrinsic motivation, rooted in a genuine interest and passion for the subject, often correlates with higher academic performance. According to Ryan and Deci (2000), students who pursue mathematics out of personal curiosity tend to exhibit greater engagement, persistence, and resilience in mastering the subject's challenges. This aligns with Deci and Ryan's (1985) Self-Determination Theory (SDT), which posits that individuals excel when they experience competence, autonomy, and a sense of connection to their field of study. These findings underscore the need for educational environments that nurture students' intrinsic motivation to sustain their long-term commitment to mathematics. Extrinsic motivation also plays a significant role, particularly through the allure of external rewards like scholarships, career prospects, and social recognition. Many students are motivated by the prestige of achieving first-class honours, as it often opens doors to further opportunities and serves as a source of social acknowledgment. Studies by Elliot and Church (1997) suggest that performance-oriented goals, where achievement is tied to external validation, can enhance students' focus and diligence. However, intrinsic motivation is generally more sustainable, fueling continuous curiosity and a deeper commitment to learning, especially when facing the rigorous demands of mathematics (Ryan & Deci, 2000). The motivation to achieve excellence in mathematics, therefore, stems from a blend of intrinsic and extrinsic factors. While intrinsic motivation fosters a deep connection with mathematics, extrinsic motivators, such as future career opportunities and family expectations, play a complementary role. Achievement motivation itself is a multifaceted construct, encompassing beliefs, task values, and goals that encourage students to reach high academic standards.

Supportive learning environment is synonymous with academic excellence (Arribathi et al., 2021). A supportive learning environment is both visual and virtual, providing adequate support to encourage and engage mathematics students to explore and achieve academic excellence. The visual learning environment are the buildings, furniture, paths and lawns, etc that provided the natural support for effective learning. It provides a space where the students feel contented, comfortable and focused, creating an opportunity for both collective and individualised thinking and reasoning. The virtual environment consists of behaviours exhibited by both teachers and students which could make or mar the academic achievement of the mathematics students. All behaviours that distract from social and academic success often weaken the self-esteem of staff and students. Wang et al. (2020) discover that supportive learning environment often have positive links with social interaction, competence and academic achievement in mathematics. Therefore, supportive learning environment is a sine qua non to academic achievement in mathematics.

Effective study habits are critical for students aiming to achieve academic excellence, particularly among first-class mathematics students. Common strategies include active learning, time management, and collaborative study (Zimmerman, 2002). The concept of self-regulated learning has evolved significantly over time. In the 19th century, education emphasized formal discipline, attributing student struggles to personal limitations in intelligence or diligence. Students were expected to work through these perceived shortcomings independently to benefit from the fixed curriculum. Ideas of self-regulation at the time were limited to developing proper personal habits, such as neat handwriting and good diction, without much regard for individual learning differences. As psychology gained recognition as a science in the early 20th century, the focus on individual differences in learning began to shift. Educational reformers like John Dewey, E.L. Thorndike, and Maria Montessori suggested modifying the curriculum to accommodate these differences. Innovations included grouping students by age or ability, introducing perceptual-motor tasks, and expanding coursework to include practical skills. Although these approaches were progressive, critics argued that American schools remained too rigid and inflexible to meet the psychological needs of all students, often

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negatively impacting students' self-images. Mid-century, educators began using standardized tests to tailor instruction to students' aptitudes and attitudes. Still, the rigidity of the curriculum limited the ability to fully address students' diverse needs. In the late 1970s and early 1980s, research on metacognition and social cognition transformed understanding of learning challenges. Metacognition, or awareness of one's own thinking processes, became a central focus. Researchers linked students' learning struggles to a lack of metacognitive awareness and their inability to identify and correct personal limitations. Social cognitive researchers also explored how social influences—such as teacher modeling—affected students' ability to set goals and monitor their progress. This growing understanding of metacognition and social cognition led to practical applications in education. Students were encouraged to set specific goals, such as completing a set number of math problems, and to track their own progress. These practices fostered a new level of self-awareness and accountability in learning, helping students develop self-regulation skills essential for academic success. Through these stages, the view of learning shifted from a rigid discipline imposed by the curriculum to a more adaptive approach that fosters self-awareness, goal-setting, and self-monitoring, empowering students to take control of their own learning processes. (Zimmerman, 2002).

Active learning techniques, such as problem-solving, self-testing, and applying concepts across different contexts, have been shown to deepen understanding and enhance retention of mathematical knowledge (Bonwell & Eison, 1991). These strategies enable students to interact with the material actively, which fosters a more robust grasp of complex topics. Self-regulated learning also play a crucial role in high achievement. Top-performing students often set specific goals, monitor their progress, and adjust their learning methods as needed, demonstrating strong self-regulation skills (Pintrich, 2004). Time management and disciplined study routines are other distinguishing traits among high-achieving students. Research by Britton and Tesser (1991) highlights that students who prioritize regular study sessions and structured schedules are better positioned to excel, as consistent practice is essential for mastering complex mathematical concepts. Collaborative learning fosters enhanced understanding and problem-solving skills. When students work together to tackle problems, explain concepts, and challenge one another's perspectives, they benefit from diverse viewpoints and mutual support. Johnson et al. (1998) found that collaborative learning reinforces knowledge and critical thinking, both are crucial for attaining academic excellence.

Mentorship, peer support, and access to institutional resources play a vital role in students' academic success, particularly in achieving first-class honours. Faculty mentors and professors provide essential guidance, helping students navigate academic challenges, build resilience, and develop confidence (Kochito et al., 2024). Mentorship allows students to receive personalized feedback and gain insights into strategies for mastering complex mathematical concepts. Effective mentorship is complemented by supportive peer networks, which provide encouragement and reduce stress levels, thereby reinforcing students' commitment to academic excellence. Peer support fosters collaborative learning, where students can exchange ideas and engage in problem-solving. Johnson et al. (1998) found that collaborative learning environments stimulate critical thinking, an essential skill for high academic performance. Structured mentoring programs and opportunities for peer-to-peer support, therefore, serve as critical components in achieving success in mathematics and other challenging fields. Socio-cultural factors, including family background, economic resources, and societal attitudes toward mathematics, also significantly influence academic achievement. Supportive family environments that value education provide students with encouragement and resources crucial for sustained academic efforts (Kochito et al., 2024). Socio-economic status further affects access to educational resources, such as private tutoring and advanced study materials, which can offer a competitive advantage. Additionally, in cultures where mathematics is highly regarded, students may feel motivated to pursue excellence, especially when mathematical proficiency is seen as prestigious. Thus, inclusive educational practices that account for diverse socio-cultural 0backgrounds can help bridge achievement gaps. Resilience and stress management are also key traits for students pursuing high academic honours in mathematics. High-achieving students often cultivate coping strategies, like setting realistic goals and seeking social support, which enable them to maintain motivation and persevere through difficulties. Research by Elliot and Church (1997) shows that resilience and self-confidence correlate with academic success, underscoring the importance of a positive academic mindset and resources for stress management in supporting high-achieving students.

Obtaining a first-class degree is widely regarded as advantageous for students, offering both tangible and intangible benefits that extend well beyond graduation. First and foremost, this level of academic distinction enhances career prospects by signaling to employers a high level of competence, dedication, and intellectual rigor. In competitive job markets, graduates with first-class honours often stand out, as many organizations value candidates who demonstrate both strong knowledge and disciplined work habits (Akinlosose, 2021). For students pursuing academic careers or

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fields that value research, a first-class degree serves as a critical qualification, enabling them to access prestigious graduate programs and scholarship opportunities. Beyond external recognition, achieving first-class honours also contributes to a student's self-confidence and growth mindset, fostering resilience and a belief in their academic abilities. Studies have shown that this self-assurance can promote a more proactive approach to learning, enabling graduates to tackle new challenges with a sense of competence and motivation (Gill, n.d.). In addition, first-class students often gain valuable soft skills through their rigorous academic journey, including time management, problem-solving, and perseverance. Students aiming for a first-class degree in mathematics should focus on developing effective study habits, seeking mentorship, and maintaining resilience. Strategies such as attending all classes, engaging in active learning, and balancing coursework with self-care are key to sustaining high academic performance (Kochito et al., 2024). Establishing a network of supportive peers and mentors, as well as regularly revisiting goals, can provide both motivation and a clear path toward achieving academic excellence.

Aim and objectives of the study

This qualitative study explores the factors influencing the attainment of first-class honours in mathematics among graduates from the Department of Mathematics at Ignatius Ajuru University of Education in Port Harcourt. The objectives are to:

1. explore the motivations that drive mathematics students to pursue a first-class honours degree.
2. investigate the study approaches and strategies employed by mathematics students in their pursuit of academic excellence.
3. identify the significant influences and experiences that mathematics students attribute to their academic success.
4. examine how mathematics students perceive the impact of achieving a first-class honours degree on their future endeavors.
5. gather advice and recommendations from mathematics students for aspiring students aiming for academic excellence in mathematics.

Research questions:

1. What motivated mathematics students to pursue a first-class honours degree?
2. How did mathematics students approach their studies to achieve academic excellence?
3. What significant influences or experiences do mathematics students attribute to their success?
4. How do mathematics students perceive the impact of achieving a first-class honours degree on their future endeavors?
5. What advice do mathematics students have for aspiring students aiming for academic excellence in mathematics?

Methodology

This study employed a qualitative research design to explore the factors influencing the attainment of first-class honours in mathematics among graduates. This approach was chosen to gain in-depth insights into the personal experiences, motivations, and strategies of the participants. A purposive sampling technique was utilized to select five graduates from the Department of Mathematics at Ignatius Ajuru University of Education, Port Harcourt. This method was chosen to ensure that the participants possessed relevant experiences and insights related to achieving first-class honours in their mathematics studies.

The data collection instrument consisted of a researcher-designed interview schedule comprising 20 items. Questions 1-4, addressing Research Question One, RQ-1 (motivation to pursue a first-class degree), questions 5-8, addressing RQ-2 (study approaches and strategies), questions 9-12: addressing RQ-3 (influences and experiences contributing to success), questions 13-16, addressing RQ-4(perceived impact of achieving first-class honours), and questions 17-20, addressing RQ-5 (advice for aspiring students). The interviews were conducted with the selected graduates using the prepared interview schedule. Each interview was recorded with the participants' consent, and responses were transcribed verbatim for accuracy. The interviewer ensured a comfortable environment to facilitate open and honest communication.

A thematic analysis approach was adopted to analyze the transcribed data. This involved identifying, analyzing, and reporting patterns (themes) within the data. The analysis process included: Familiarization with the data through repeated reading of transcripts, generating initial codes relevant to the research questions, searching for themes by

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collating codes into potential themes, reviewing themes to ensure they accurately reflected the data, and defining and naming themes for clarity. Ethical guidelines were strictly followed throughout the research process. This included obtaining informed consent from participants before interviews, ensuring confidentiality of their responses, and providing the right to withdraw from the study at any point without consequence. Participants were assured that their data would be used solely for academic purposes.

Results

Motivation and valuing Mathematics as a Discipline

The theme of valuing mathematics as a rigorous and transformative discipline emerged prominently across participants' responses. For these students, mathematics was more than an academic requirement, it was a core pursuit, a "language of science" that, as one participant put it, "builds mental discipline and encourages logical reasoning." This view positions mathematics as a foundation for intellectual and practical pursuits, underscoring the profound personal commitment students feel toward mastering it. Several participants articulated mathematics as a field that develops essential skills in problem-solving, critical thinking, and structured reasoning. This intellectual and practical allure made mathematics both challenging and rewarding. As one interviewee expressed, "Mathematics fosters mental discipline," reinforcing the notion that mathematics trains students to think systematically and approach complex problems with rigor.

The participants also set ambitious personal goals that went beyond achieving high grades. One student reflected, "My goal is to be one of the best, if not the best, in the department." This drive for excellence wasn't limited to personal achievement; it extended to influencing their academic community. Another participant described their aspiration to become "a great mathematician capable of applying mathematical principles to solve real-life problems," highlighting an ambition that bridges academic success and practical impact. A participant attributed her motivation to her mathematics teacher, whose passionate teaching made her love the subject. Her primary goal was to graduate as the overall best student. She stated that her strong desire to excel positively influenced her decision to aim for a first-class honours degree. She confirmed that personal and external factors played a role in her motivation.

Furthermore, the goal of reshaping perceptions around mathematics emerged as a strong motivator. One student shared their intent to dismantle the stereotype of mathematics as inherently difficult, a perception they felt discouraged students at secondary and higher education levels. "Understanding the subject requires learning from simple to complex," they explained, advocating for a progressive approach to mathematics education that demystifies challenging concepts. This ambition suggests that the participants' motivations extended beyond their own academic success; they saw themselves as future leaders and advocates for a more accessible approach to learning mathematics. The collective drive to excel, coupled with a vision to influence the field of mathematics, underscores a shared motivation among these students. For them, mathematics was not just a subject to master but a discipline through which they could inspire others and effect change. In these aspirations, participants reveal a profound respect for the field and a commitment to overcoming challenges, not only for their success but to pave the way for future generations of learners.

Rigorous Study Strategies and Academic Resource Management

A central theme across participants' responses was the adoption of rigorous study strategies tailored to meet the demands of their mathematics curriculum. Many interviewees emphasized the importance of meticulous time management, crafting personalized study schedules that enabled them to prioritize challenging courses. For example, one participant recounted, "I allocated more time to the courses that seemed tougher. I also applied continuous practice, breaking down complex problems into parts." This approach, deconstructing difficult concepts into manageable sections, not only facilitated comprehension but also empowered students to tackle complex material with a clear, structured approach. A participant employed multiple strategies, including purchasing foreign textbooks, engaging in online studies, making notes, revising courses weekly, and teaching other students to reinforce her understanding. Online research proved to be the most effective technique for her. She preferred studying in the early hours of the morning, avoiding midnight reading. Self-determination was her key to managing academic coursework, self-study, and other commitments effectively.

The subjects singled out as specially demanding included real analysis, fluid mechanics, and complex analysis, each requiring intensive study and sustained focus. For these topics with high-difficulty, students often increased their study time, demonstrating a proactive commitment to mastering content. As one participant explained, "I prepared a

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timetable and understood my study time, which helped me stay consistent," underscoring the role of consistent, organized study habits in maintaining academic progress.

Participants also made strategic choices in their selection of study materials, favoring academic resources that aligned closely with the curriculum's challenges. One student mentioned, "I used textbooks like Advanced Engineering Mathematics by H.K. Dass," highlighting a preference for resources that supported in-depth comprehension of advanced concepts. Such materials provided a foundation for understanding complex topics and complemented the students' individualized learning strategies.

These rigorous study techniques illustrate not only the participants' dedication but also a sophisticated approach to learning. Through organizing their schedules, selecting effective resources, and employing incremental problem-solving techniques, these students were able to manage their demanding coursework and navigate the complexities of their mathematics studies. This theme highlights the importance of both time management and resourcefulness in academic success, reflecting a shared commitment to mastering challenging content through deliberate and methodical preparation.

Influence of Peer and Faculty Support on Academic Success

Support from peers and faculty members emerged as a significant influence on the students' academic journeys, highlighting the collaborative nature of their learning experiences. Interviewees emphasized the role of peer interactions in creating an environment characterized by encouragement and mutual understanding. This sense of community was pivotal as students navigated increasingly challenging academic tasks. One participant noted, "Interactions with peers contribute positively… We always consider the task before us, knowing the higher you go, the tougher it becomes." This acknowledgment of shared challenges not only fostered resilience but also cultivated a collaborative mindset among students, reinforcing their commitment to academic excellence. A participant identified her course adviser and another lecturer as pivotal supporters in her academic journey. Specific courses and projects during her undergraduate studies had a profound impact, although she did not elaborate on their specifics. While she was not overly social and had few friends, she relied on study mates for academic collaboration. Despite graduating as the overall best student, she faced a setback when denied the recognition due to administrative issues. She eventually graduated as the best student in her department and faculty.

The dynamics within this peer support system was marked by a collective determination to succeed, as students motivated one another through shared experiences. The recognition that advanced studies come with greater difficulty reinforced their solidarity; they engaged in discussions that allowed them to process complex concepts together, which helped mitigate feelings of isolation that often accompany rigorous academic programs.

Moreover, the influence of faculty members was a recurring theme among participants. Many students articulated the importance of mentorship from their lecturers, particularly those who taught foundational courses during their first year of study. One participant emphasized, "Faculty members, especially those at higher levels, are very important. To excel, you must do well in faculty courses." This statement highlights the critical role faculty play not just in imparting knowledge but in guiding students through the academic landscape and helping them set high standards for themselves.

This mentorship extended beyond academic instruction; faculty members often provided insights into the broader expectations of the discipline, fostering a culture of high achievement. Students recognized that strong faculty support was essential in helping them navigate the complexities of their programs and uphold the rigorous standards necessary for attaining first-class honours.

The intertwined support systems from peers and faculty created a nurturing academic environment that empowered students to excel. Through fostering collaborative relationships and providing guidance, these support networks significantly contributed to the students' resilience and commitment to their academic goals, ultimately shaping their journeys toward success in mathematics.

Perceived Impact of First-Class Honours on Future Opportunities

The participants expressed a strong belief that obtaining first-class honours in mathematics would yield substantial professional and academic advantages. This distinction was perceived as a key factor in setting them apart from peers, providing them with unique leverage in both academic and career settings. As one participant put it, "Achieving a first-class honours degree in Mathematics will give me an edge over my peers… I believe it will push me to continue striving for excellence." This statement reflects a common sentiment among interviewees, who viewed academic

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excellence as a catalyst that would propel them toward continued achievements, instilling a mindset of resilience and high standards. Achieving first-class honours made employment easier for her and improved her ability to study and understand concepts effortlessly. She aims to become a lecturer and make a significant impact on future generations. Achieving academic excellence brought significant changes in her approach to challenges and self-perception.

For some students, first-class honours represented more than just a degree; it was seen as a pathway to greater educational and professional opportunities, such as scholarships and advanced studies. This aspiration underscored the participants' motivation to sustain their performance beyond their undergraduate years. The prospect of further education was a driving force for many, with one interviewee remarking on their hope that "with academic excellence, I will be offered or given a scholarship for a Master's degree program." This view highlights how academic distinction is perceived as an asset for accessing resources and opportunities that may otherwise be out of reach.

Moreover, the value of first-class honours extended beyond personal advancement to recognition within educational environments where participants had worked. One interviewee shared, "there's special recognition in private schools where I taught Mathematics/Further Mathematics," suggesting that their academic achievements had already garnered professional acknowledgment. This early professional recognition reinforced the participants' sense of pride and accomplishment, validating their efforts and motivating them to uphold these high standards in both academic and professional settings.

The recognition and opportunities associated with first-class honours thus appear to have a profound and enduring impact on participants. They not only viewed this achievement as a foundation for future success but also as a source of inspiration to consistently pursue excellence in all future endeavors. Through their accomplishments, they have cultivated a legacy of dedication and resilience that they believe will continue to influence their academic and career trajectories.

Advice for Aspiring Students in Mathematics

Based on their academic journeys, the interviewees shared valuable advice for students aiming for excellence in mathematics, underscoring the significance of passion, discipline, and strategic goal-setting. For these students, passion was identified as a fundamental motivator that sustained their commitment to the field. One participant highlighted this, stating, "You must have a passion for mathematics because it is the greatest motivation for excellence." This intrinsic drive was repeatedly cited as a necessary foundation for navigating the challenges associated with rigorous mathematics coursework. A participant advised students to be determined in achieving their set goals. She recommended forming study groups, conducting online research, and studying to deepen understanding of mathematical concepts. She emphasized the critical role of mentorship and faculty guidance in achieving academic excellence. Her advice was to minimize social distractions, stay focused, and work diligently toward set goals.

In addition to passion, participants emphasized the importance of early preparation and the role of foundational knowledge in building a solid base for advanced studies. One interviewee recommended that "an undergraduate aspiring for academic excellence in Mathematics must start his/her journey from the secondary level, especially with Further Mathematics." This advice reflects a shared belief that excelling in mathematics requires consistent effort and an early grasp of core mathematical concepts, which facilitate a smoother transition to complex topics encountered in higher education.

Discipline and a focused approach were also cited as essential for maintaining high academic performance. Participants advised students to maintain a competitive GPA by aiming for a high ratio of A grades to B grades, with one participant offering the practical guidance to "aim for grades A and B, with the number of B's less than the number of A's." This structured approach to goal-setting and self-assessment underscored the value of setting specific academic targets to track progress and stay motivated.

Moreover, the interviewees recommended leveraging faculty guidance and employing strategic time management. Faculty mentors, especially those teaching foundational courses, were seen as crucial in providing direction and support. Time management strategies, including developing consistent study routines, were frequently mentioned as effective ways to balance demanding coursework and avoid academic burnout. The students believed that setting up a structured study plan early would allowed them to stay focused and prioritize high-value tasks.

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The participants advised future students to cultivate a genuine passion for mathematics, start building a strong foundation early, and adopt disciplined study habits and goal-setting strategies. Through following this advice, students can position themselves for success, drawing upon both their intrinsic motivation and external resources like faculty mentorship to excel academically. This combination of passion, preparation, and disciplined effort emerged as the collective wisdom from students who had already achieved excellence in mathematics.

Discussion

The first theme, Motivation and valuing Mathematics as a Discipline, emerged strongly as interviewees emphasized the intellectual and practical importance of mathematics, describing it as "the language of science" that enhances logical reasoning and problem-solving skills. This perspective aligns with prior studies that emphasize mathematics as foundational for analytical skills critical in STEM fields. For example, research on students' motivation highlights how mathematics encourages mental discipline and strategic thinking, underscoring its unique role in fostering cognitive skills essential in both academic and professional domains. Studies reveal that students who view mathematics positively often develop a resilience to challenging material, suggesting that intrinsic motivation and goal-setting are central to persistence and performance in mathematics (Sasidharan, & Kareem 2023). This theme reflects how students' value of mathematics goes beyond the classroom, intending to use their skills to contribute positively to the field and to dispel misconceptions around the subject's difficulty, which has been a recurring objective in academic literature.

The second theme, Rigorous Study Strategies and Academic Resource Management, highlights how disciplined study approaches and strategic resource use are essential for academic success, especially in challenging fields like mathematics. Students who excel academically often employ structured study routines, such as regular review sessions and targeted practice, which help reinforce their understanding and retention of complex material. Moreover, successful students tend to maximize available resources, such as academic support centers, tutoring services, and online educational tools to clarify difficult topics and foster a deeper comprehension. Utilizing these resources not only aids in overcoming challenging concepts but also promotes a collaborative learning environment through interactions with peers and instructors. Effective resource management, therefore, supports students in developing a comprehensive approach to learning, as they balance self-study with guided instruction. Research on educational methods supports these findings, suggesting that systematic resource use and thorough study habits are pivotal for academic achievement in high-demand areas. Nowell et al. (2017) emphasize that applying methodical strategies to thematic analysis in educational research can increase trustworthiness, underscoring the importance of structured approaches in both learning and research contexts

The third theme, Mentorship and Academic Support Networks, emphasizes the vital role of guidance and collaborative networks in achieving academic excellence. Students pursuing high academic honours frequently rely on mentors, such as professors, advisors, and senior students, who provide guidance, insights, and encouragement. These mentors offer not only academic support but also strategies for managing challenges and navigating the complexities of their field. Furthermore, participation in academic support networks, such as study groups or research collaborations, helps students access diverse perspectives, enhance critical thinking, and stay motivated. According to Adeosun's (2021) study, the influence of the home environment and mentorship significantly impacts students' academic outcomes by fostering critical thinking and engagement, which are essential for success in higher education.

The fourth theme examines the perceived impact of achieving first-class honours on students' future academic and career paths. Graduates often view this achievement as a gateway to prestigious opportunities, both academically and professionally, and as a validation of their dedication and academic rigor. This distinction is perceived to enhance their confidence, motivate them for further challenges, and offer them a competitive edge in the job market. The high level of accomplishment also boosts self-efficacy, empowering graduates to pursue ambitious goals with a solid foundation of academic success and resilience. The sense of accomplishment associated with earning top honours aligns with Bandura's (1986) theory of self-efficacy, which highlights how belief in one's abilities influences motivation and achievement. High academic achievements reinforce self-efficacy, which in turn enhances students' readiness for advanced career pursuits. As Bandura notes, self-efficacy shapes individuals' ambitions and resilience in the face of future challenges.

The fifth theme in this study explores the advice and recommendations provided by successful mathematics students to those aiming for academic excellence. Key insights suggest that students who achieved first-class honours

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emphasize the importance of consistent study habits, effective time management, and proactive engagement with mentors and faculty members. Successful students also advise maintaining a growth mindset, embracing challenges, and continuously refining problem-solving skills. Their insights often point to the value of intrinsic motivation, encouraging aspiring students to find a genuine interest in mathematics to sustain long-term dedication and resilience. This advice aligns with self-determination theory, which posits that intrinsic motivation enhances engagement and performance, (Deci & Ryan 2000). When students are internally motivated by a love for learning or a sense of personal growth, they are more likely to excel academically, even in challenging fields like mathematics.

Conclusion

A growth mindset and resilience in the face of academic challenges further enhance students' ability to excel. Through cultivating a passion for mathematics, maintaining disciplined study routines, and utilizing available academic resources, students are better equipped to achieve top honours. The study identifies the key factors that contribute to the attainment of first-class honours in mathematics. The findings indicate that students' intrinsic motivation, effective study habits, and engagement with supportive mentors are central to their academic success.

Recommendations

Based on the findings of the study, the following recommendations are proposed:

1. Institutions should establish mentorship programs that connect students with experienced faculty members or alumni. Mentorship can provide valuable guidance, motivation, and insight into effective study practices.
2. Encourage group study sessions, workshops, and collaborative projects to help students engage deeply with complex mathematical concepts. Active learning environments have been shown to enhance understanding and retention of material.
3. Developing students' resilience can help them manage academic pressures and persist through challenging coursework. Workshops or seminars focused on building resilience and stress management would support students aiming for high academic achievement.
4. Universities should ensure that resources such as tutoring, study skills workshops, and counseling are readily available to support students' academic needs and personal well-being.
5. Facilitate sessions where students can reflect on their progress, set academic goals, and identify areas for improvement. This practice can foster self-motivation and a sense of responsibility for their learning journey.

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Appendix

Interview questions to address the research questions

1. Can you describe what initially inspired you to pursue a degree in mathematics?
2. What specific goals or aspirations did you have in mind when you began your undergraduate studies?
3. How did the desire to achieve academic excellence influence your decision to strive for a first-class honours degree?
4. Were there any personal or external factors that played a role in motivating you to pursue this academic goal?
5 Can you discuss the study strategies or approaches you employed to excel in your mathematics courses?
6 What resources or techniques did you find most effective in understanding complex mathematical concepts?
7 Did you have any specific routines or habits that helped you maintain focus and productivity in your studies?
8 How did you balance academic coursework, self-study, and other commitments to optimize your learning experience?
9. Can you identify any specific individuals or mentors who played a significant role in supporting your academic journey?
10. Were there any particular courses, projects, or experiences during your undergraduate studies that stand out as having a profound impact on your academic growth?
11. How did interactions with peers or participation in extracurricular activities contribute to your overall academic experience?
12. Can you describe a challenging academic situation you encountered and how you navigated through it?
13. In what ways do you believe achieving a first-class honours degree in mathematics has influenced your personal and professional development?
14. How do you envision leveraging your academic achievements in mathematics for future career opportunities or further academic pursuits?
15. Have you noticed any changes in the way you approach challenges or view your abilities as a result of achieving this academic distinction?
16. Can you discuss any feedback or recognition you have received regarding your academic achievements and how it has affected your aspirations?
17. Based on your experiences, what advice would you offer to current mathematics students who aspire to achieve academic excellence?
18. Are there any specific strategies or resources you would recommend to help aspiring students succeed in their mathematics studies?
19. How important do you believe mentorship or seeking guidance from faculty members is for students aiming for academic excellence?

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20. Can you share any lessons learned or insights gained during your own journey that you think would benefit aspiring mathematics students?

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