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Exploring Mathematics Anxiety in Business Mathematics Students and Its Perceived Influence on Academic Achievement in Higher Education

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Abstract

Mathematics is a foundation of business education, many business students approach it with fear and low motivation. This study explored students' experiences and sources of mathematics anxiety in Business Mathematics and their perceptions of how that anxiety affects their academic achievement. Achievement was explored as students perceive it; no grades or test scores were collected. A qualitative case study was carried out at a private higher education institution in Rwanda. Eight undergraduate students from the Faculty of Social, Economic Sciences and Business Management who were studying a mathematics module took part. Participants were purposively sampled, and recruitment stopped when the interviews were judged to provide enough information for the study objectives (code saturation). Data came from semi-structured interviews and were analysed with Braun and Clarke's (2006) six-stage thematic analysis, in which codes were grouped into themes and quotations were used only as illustrations. For the first objective, six themes emerged: persistent fear, worry, and physical tension; negative prior schooling experiences; abstract, procedural, and fast-paced teaching; fear of mistakes and judgement by peers; panic during tests and examinations; and recognition that mathematics is basic, yet low attitudes toward it. For the second objective, six further themes emerged: perceived lower test and examination performance; avoidance and withdrawal from mathematics activities; weakened self-efficacy and negative self-labelling; perceived difficulty in applied business modules; reduced persistence, confidence, and progression; and concern about workplace and field readiness. Participants held low attitudes toward mathematics even though they recognised it as basic to accounting, economics, finance, statistics and daily work tasks. The findings suggest that a contextualised, confidence-building approach to teaching Business Mathematics qualities development and testing.

Keywords: academic achievement; business mathematics; higher education; mathematics anxiety

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Introduction

Mathematics anxiety is a negative emotional response of fear, tension, worry, or apprehension that arises when people learn or perform mathematical tasks, and it can interfere with mathematical thinking and performance (Ashcraft, 2002; Richardson & Suinn, 1972). Decades of research link it to lower mathematics achievement (Barroso et al., 2021; Hembree, 1990), and the pattern appears across countries and educational levels (Foley et al., 2017).

The prevailing explanation is that anxious thoughts occupy working memory that is needed for calculation and reasoning (Ashcraft & Kirk, 2001). Students experiencing this anxiety may feel nervous when asked to solve a problem, avoid participation, fear making mistakes before classmates, panic during examinations, believe they are "not good at mathematics," and avoid mathematics-related courses altogether (Dowker et al., 2016; Maloney & Beilock, 2012). This matters in business education because mathematics is not an isolated subject: it underpins accounting, economics, finance, statistics, marketing analytics, and the quantitative decisions graduates make daily at work.

In Rwanda, where business and economic programmes are expanding to support national development, many students nevertheless appear to regard Business Mathematics as a hurdle rather than a tool, and learning is further complicated for students who moved from French to English as the language of instruction. The problem is that students who depend on mathematics in nearly every module, and will depend on it in their careers, hold low attitudes toward it and may perceive that anxiety limits their performance. The Rwandan studies of mathematics anxiety that we identified involve lower-secondary learners and rely on quantitative scales (Iyamuremye et al., 2022, 2023). To the authors' knowledge, no published study has explored, in students' own words, how business students in Rwandan private higher education experience mathematics anxiety or how they think it affects their achievement.

This study therefore pursued two objectives: (1) to explore students' experiences and sources of mathematics anxiety in Business Mathematics, and (2) to investigate students' perceptions of the influence of mathematics anxiety on their academic achievement. Academic achievement is examined throughout as students' perceived achievement.

Literature Review

Mathematics anxiety was first measured systematically by Richardson and Suinn (1972), and it is now understood as a multidimensional construct with emotional, cognitive, and behavioural components (Dowker et al., 2016). Its origins are commonly traced to earlier negative experiences with mathematics, teaching that stresses speed, memorisation and right answers, and social messages about who is "a maths person" (Ashcraft, 2002; Tobias, 1993). Teachers' own anxiety can also be transmitted to learners (Beilock et al., 2010), and anxiety can begin early and intensify over time (Ramirez et al., 2013).

Bandura's (1997) theory of self-efficacy and Eccles and Wigfield's (2002) expectancy-value framework explain why: students who doubt their capability and see little value in a subject invest less effort, and the resulting poor results confirm their doubts. Importantly, the relationship between anxiety and performance may run in both directions, as weak mathematical skill can breed anxiety and anxiety can

undermine skill (Carey et al., 2016). Pekrun's (2006) control–value theory adds that anxiety arises when students value an activity but doubt that they can control its outcome, a combination that is likely when mathematics is compulsory and assessed.

The consequences for achievement are well documented. A meta-analysis by Barroso et al. (2021) found a significant negative association between mathematics anxiety and mathematics achievement, and Hembree's (1990) earlier synthesis showed that mathematics-anxious students score lower, avoid mathematics coursework, and hold less favourable attitudes. Ashcraft and Moore (2009) described an "affective drop" in which anxious students perform below their true ability when stakes and pressure are high, and Foley et al. (2017) showed the link holds across many countries. These studies are largely correlational, and they usually measure achievement through test scores or grades rather than through students' own perceptions of their achievement.

Much of this research relies on quantitative scales and on school or general-university samples, so less is known about how business students interpret their own anxiety in the context of applied, discipline-specific mathematics, particularly in African higher education where contextual factors such as language transition and prior schooling may shape experience. In Rwanda, the studies of mathematics anxiety that we identified concern lower-secondary learners and use quantitative scales (Iyamuremye et al., 2022, 2023). Research on business students has examined the prevalence of anxiety and its link to the choice of business major in Ireland (McCullagh et al., 2024) and anxiety among accounting students in the United Kingdom (Warwick & Howard, 2016), both in quantitative studies, and a South African study of tertiary students also used a questionnaire (Mutodi & Ngirande, 2014). A systematic review concluded that little research has been done on instructional strategies that reduce mathematics anxiety in Sub-Saharan Africa (Luneta & Sunzuma, 2022). We found no qualitative study that explores how business students in Rwandan private higher education experience mathematics anxiety, which is the gap this study addresses. Qualitative work is well suited to such questions because it captures students' own accounts of how anxiety arises and what it means for their studies (Creswell & Poth, 2018). This gap motivates the present exploration and its implications for instruction.

Methods

The study used a qualitative approach and a case study design (Yin, 2018). A case study allows an in-depth examination of a contemporary phenomenon in its real-life setting, here mathematics anxiety among Business Mathematics students at one selected private higher education institution in Rwanda. The case was bounded by a single institution, a single faculty, and the Business Mathematics module.

Participants were eight students registered in the Faculty of Social, Economic Sciences and Business Management who were studying the mathematics module at the selected institution. Purposive sampling identified students with direct experience of the module. Eligible students were undergraduates registered in the faculty who were studying the mathematics module and who agreed to an audio-recorded interview. Students were invited. The final sample included women and men, students from Years 1 to 3, and three programme areas, which allowed a range of experiences to be heard. Sample size was not fixed in advance. After each interview the transcript was coded and its codes were compared with the running codebook, and recruitment stopped when further interviews were judged to add no new codes relevant to the two objectives, which is the point of code saturation

(Guest et al., 2006; Hennink & Kaiser, 2022; Saunders et al., 2018). Eight interviews were judged sufficient for three reasons. First, the sample was fairly homogeneous: all participants were undergraduates in one faculty who were studying the same module. Second, the objectives were narrow and focused on a specific experience. Third, the interview protocol and the participants' detailed accounts gave the data strong information power (Malterud et al., 2016), which reduces the number of participants needed. This sample sits at the lower margin of the 9 to 17 interviews that Hennink and Kaiser (2022) found were typically needed to reach saturation in studies with focused aims, and Guest et al. (2006) found that saturation had largely occurred by the twelfth interview. Saturation is therefore treated here as a judgement about whether the data were adequate for these objectives, not as proof that no further experiences exist (Braun & Clarke, 2021), and the sample size is acknowledged as a limitation.

Data were collected through semi-structured interviews guided by an interview protocol covering students' feelings during mathematics lessons and tests, remembered experiences with mathematics, perceived causes of anxiety, use of mathematics in other modules and daily responsibilities, and perceived effects on grades and participation. Interviews were conducted in English, the language of instruction, with clarification in Kinyarwanda where participants preferred to explain an idea in their first language. They were audio-recorded with consent and transcribed verbatim. Following guidance for cross-language qualitative research (Squires, 2009), passages in Kinyarwanda were translated into English by authors, marked in the transcript so that they could be told apart from English speech, and checked against the audio recording by a second bilingual author. Analysis was carried out on the English transcripts with translated passages flagged. When the meaning of a translated phrase was unclear, the authors discussed it and, where possible, confirmed it with the participant during member checking.

Transcripts were analysed using Braun and Clarke's (2006) six-stage thematic analysis: (1) familiarisation with the data, (2) generating initial codes, (3) searching for themes, (4) reviewing themes, (5) defining and naming themes, and (6) producing the report. Analysis was primarily inductive and semantic: codes were derived from the data and stayed close to participants' own words rather than being taken from an existing framework. The authors coded independently and resolved differences through discussion. Credibility was supported through member checking, peer debriefing, and an audit trail (Lincoln & Guba, 1985).

A code is a short label attached to a meaningful segment of a transcript (for example, "heart beating fast" or "mind empty"). A theme is a pattern of shared meaning built by grouping related codes around a central idea (for example, persistent fear, worry, and physical tension). A quotation is an illustrative extract that shows how a theme appears in participants' words; it is not itself a code or a theme. For Objective 1, codes describing feelings, remembered experiences, perceived causes, and the use of mathematics were grouped into six themes. For Objective 2, codes describing perceived effects on marks, participation, confidence, other modules, and future work were grouped into six themes. In the fourth phase, candidate themes were checked against the coded extracts and then against the full data set, and themes were revised where they overlapped or lacked support across participants.

Familiarity to the setting helped in building rapport and in understanding the module, but it also carried risks: participants might give socially desirable answers or hesitate to criticise lecturers, and the authors' expectation that contextualised teaching reduces anxiety might have shaped the questions

and the interpretation. To limit these risks, participants were told that their answers would not affect their assessment and were identified by pseudonyms; the authors kept reflective notes during data collection and analysis; the authors coded independently and discussed differences; and member checking, peer debriefing, and an audit trail were used to challenge interpretations (Lincoln & Guba, 1985; Berger, 2015), on researcher position and reflexivity.

Participation was voluntary and informed consent was obtained. Participants were assured of anonymity and confidentiality, and pseudonyms (S1–S8) are used throughout. Participants could withdraw at any time.

Results

Demographic Information

Table 1 presents the profile of the eight participants.

Table 1: Demographic Characteristics of Participants (N = 8)

Participant	Gender	Age	Year of study	Programme area
S1	Female	20	Year 1	Finance
S2	Male	22	Year 2	Accounting
S3	Female	21	Year 2	Economics
S4	Female	24	Year 3	Finance
S5	Male	23	Year 3	Accounting
S6	Female	20	Year 1	Economics
S7	Male	25	Year 3	Finance
S8	Female	22	Year 2	Accounting

Five participants were female and three were male, aged 20 to 25 years. All were undergraduates in the Faculty of Social, Economic Sciences and Business Management, and several were studying in weekend sessions while working, as is common in Rwandan private higher education.

Results for Objective 1: Students' Experiences and Sources of Mathematics Anxiety

Across all interviews, participants held low attitudes toward mathematics, describing it as difficult, stressful, and something to "survive." At the same time, they acknowledged that mathematics is basic to the modules they must complete and to their daily and professional tasks. Six themes emerged. The themes are analytic patterns built from codes, and the quotations that follow are illustrative extracts, not evidence in themselves.

Theme 1: Persistent fear, worry, and physical tension

Every participant described nervousness when facing mathematical tasks. S1 said, "*When the lecturer says 'come and solve it on the board,' my heart starts beating fast and my mind becomes empty*." S6 described "*sweating and shaking even when I know the formula*."

Theme 2: Negative prior schooling experiences

Participants traced their anxiety to secondary school, where mathematics was associated with punishment, ridicule, or failure. S4 recalled, "*In secondary school, the teacher would shout when you got it wrong. Since then I believe mathematics is not for me*." S7 said he had "*carried that fear all the way to university*."

Theme 3: Abstract, procedural, and fast-paced teaching

Participants felt lessons stressed formulas and speed rather than understanding or business meaning. S2 explained, "*The lecturer writes formulas and moves on. We do not see where we will use them in business*." S8 added, "*If I miss one step, I am lost for the whole lesson.*"

Theme 4: Fear of mistakes and judgement by peers

Several students avoided participation because they feared embarrassment. S3 said, "*I prefer to keep quiet. If I answer wrongly, classmates will laugh or think I am weak*." S5 described being "*afraid to ask because it shows you do not understand*."

Theme 5: Panic during tests and examinations

Participants reported blanking, rushing, and making careless errors under time pressure. S6 said, "*In the exam room, I forget everything I studied the night before*." S1 noted, "*Even easy questions look difficult when I panic*."

Theme 6: Recognising that mathematics is basic, yet holding low attitudes toward it

Participants readily named where mathematics appears: accounting, financial management, economics, statistics, marketing, budgeting, pricing, loan and interest calculations, and daily tasks such as computing profit or salaries. Yet this recognition did not raise their attitudes. S5 said, "*I know we use mathematics in accounting and costing every day, but I still hate it*." S4, who manages a small shop, stated, "*I calculate profit and stock every day, but in the classroom it feels like a different, frightening subject*." S2 reflected, "*We cannot run away from mathematics in any module, but I wish it was taught in a friendlier way*."

Results for Objective 2: Perceived Influence of Mathematics Anxiety on Academic Achievement

Participants perceived that anxiety harmed their academic achievement, even though mathematics supports nearly all their other modules. Six themes emerged. Every theme below describes what participants reported and believed.

Theme 7: Perceived lower test and examination performance

Participants attributed what they described as poor marks to anxiety rather than to lack of ability; these marks were self-reported and were not checked against records. S3 said, "*I understand when I*

practise at home, but my marks in the exam are low because of fear." S7 reported, "*I have lost marks on questions I could solve after leaving the room*."

Theme 8: Avoidance and withdrawal from mathematics activities

Students skipped questions, avoided group problem-solving, delayed assignments, and sometimes missed lessons. S1 admitted, "*I postpone mathematics homework until the last day*." S5 said, "*When I know there will be calculations, I prefer not to attend*."

Theme 9: Weakened self-efficacy and negative self-labelling

Participants described themselves as "not mathematical." S6 said, "*I have decided I am simply bad at mathematics*," and S8 explained, "*Every failure confirms to me that I cannot do it*."

Theme 10: Perceived difficulty in applied business modules

Because mathematics underpins other subjects, participants reported that anxiety spread to them. S2 explained, "*In accounting and statistics, I struggle with ratios, percentages, and formulas, and my results drop there too*." S3 said economics graphs and calculations "*become a burden*."

Theme 11: Reduced persistence, confidence, and progression

Participants reported discouragement, repeated attempts, and worry about completing the programme. S7 said, "*Mathematics is the module that can delay my graduation, so I carry that stress every semester*." S4 said she sometimes "*thinks of giving up*."

Theme 12: Concern about workplace and field readiness

Participants worried that unresolved anxiety would limit their performance in jobs involving budgeting, pricing, reporting, and financial decisions. S8 said, "*In my future work I will need mathematics every day, and if I am afraid of it I will depend on others*." S5 added, "*Employers will expect us to calculate quickly and confidently*."

Table 2: From Codes to Themes for Both Objectives

Theme	Illustrative codes grouped under the theme	Participants quoted
Theme 1: Persistent fear, worry, and physical tension	Nervousness before mathematical tasks; fast heartbeat; mind going blank; sweating and shaking	S1, S6
Theme 2: Negative prior schooling experiences	Punishment or ridicule in secondary school; teacher shouting at errors; belief that mathematics "is not for me"; fear carried into university	S4, S7
Theme 3: Abstract, procedural, and fast-paced teaching	Emphasis on formulas and speed; no link to business use; getting lost after missing one step	S2, S8
Theme 4: Fear of mistakes and judgement by peers	Staying silent; fear of being laughed at; reluctance to ask questions	S3, S5
Theme 5: Panic during tests and examinations	Blanking; rushing; careless errors under time pressure; easy questions seeming difficult	S6, S1

Theme	Illustrative codes grouped under the theme	Participants quoted
Theme 6: Recognising that mathematics is basic, yet holding low attitudes toward it	Naming uses in accounting, finance, economics, and daily tasks; continued dislike; classroom mathematics feeling different from everyday use	S5, S4, S2
Theme 7: Perceived lower test and examination performance	Attributing low marks to fear; losing marks on questions that could be solved later; understanding at home but not in the examination	S3, S7
Theme 8: Avoidance and withdrawal from mathematics activities	Skipping questions; avoiding group problem-solving; delaying assignments; missing lessons	S1, S5
Theme 9: Weakened self-efficacy and negative self-labelling	Describing oneself as "not mathematical"; deciding one is bad at mathematics; reading failure as proof of inability	S6, S8
Theme 10: Perceived difficulty in applied business modules	Anxiety spreading to accounting, statistics, and economics; struggling with ratios, percentages, and graphs; results dropping	S2, S3
Theme 11: Reduced persistence, confidence, and progression	Discouragement; repeated attempts; worry about delayed graduation; thinking of giving up	S7, S4
Theme 12: Concern about workplace and field readiness	Worry about budgeting, pricing, and reporting; fear of depending on others; employer expectations of quick, confident calculation	S8, S5

Discussion

The results reveal a paradox: students regard mathematics as difficult and unpleasant, yet they readily acknowledge that it is fundamental to their undergraduate modules and daily work. Their low attitudes are not a matter of failing to see that mathematics matters, which is the "value" component in Eccles and Wigfield's (2002) framework. In participants' accounts, they appear to stem instead from fear, low expected success, and weak self-efficacy (Bandura, 1997), which is consistent with research showing that anxiety and negative attitudes persist regardless of perceived usefulness (Dowker et al., 2016; Hembree, 1990). The findings both support and qualify the theoretical frameworks used. They support Bandura's (1997) account, because participants' self-labelling ("I have decided I am simply bad at mathematics") and their reading of every failure as proof of inability (Theme 9) show self-efficacy beliefs being shaped by earlier experiences of failure and ridicule (Theme 2). They qualify a simple expectancy–value reading, however: if low effort followed only from low perceived value, participants who could name many uses of mathematics should have been motivated, yet they described avoidance and dislike. A fuller reading draws on later developments of expectancy–value theory, which add the emotional and psychological costs of engaging in a task (Eccles & Wigfield, 2020), and on Pekrun's (2006) control–value theory, in which anxiety arises when a task is valued but its outcome feels out of one's control. That is a fair description of a compulsory, assessed subject that students

also expect to need in their careers. These are interpretations with which the data are consistent; the study was not designed to test the theories or to establish causal pathways.

Regarding the first objective, the sources participants named are consistent with the literature. Negative prior schooling experiences and shaming by teachers reflect the developmental roots of mathematics anxiety (Ashcraft, 2002; Beilock et al., 2010; Tobias, 1993). Fear of mistakes before peers and panic in examinations echo the anxiety-related disruption of working memory and the "affective drop" in high-pressure performance (Ashcraft & Kirk, 2001; Ashcraft & Moore, 2009). Participants' reports of a mind going empty are consistent with this account, but interview data cannot show that working memory was in fact disrupted, which would require cognitive measures. The theme of abstract, formula-driven teaching is especially significant for this study: participants could not see the business meaning of what they were taught, even though they used similar calculations in shops, accounts, and workplaces. This suggests a gap between classroom mathematics and applied business practice, rather than a lack of real-world exposure. Although the introduction noted that the change from French to English as the language of instruction may complicate learning, language did not emerge as a theme in participants' accounts, so this study cannot say whether it contributes to anxiety.

Regarding the second objective, participants' perceptions that anxiety lowers marks, encourages avoidance, and erodes self-efficacy are consistent with meta-analytic evidence of a negative anxiety–achievement relationship (Barroso et al., 2021; Foley et al., 2017). That evidence concerns measured achievement, whereas the present data concern perceived achievement, so the two are compatible but not interchangeable: the interviews cannot show that participants' marks were in fact lower than those of less anxious students. Participants' attribution of low marks to anxiety rather than to ability (Theme 7) may be accurate, but it may also partly reflect a self-protective explanation or gaps in prior knowledge, and self-reports alone cannot separate these possibilities. The cyclical pattern they described, in which failure confirms self-doubt and self-doubt prompts avoidance and further failure, is compatible with the bidirectional account proposed by Carey et al. (2016). The spread of difficulty into accounting, economics, and statistics suggests, in participants' accounts, that the effects are not confined to one module, which raises the stakes of how Business Mathematics is taught. Participants' worry about workplace readiness also indicates that they see the issue as one of professional competence as well as grades.

Taken together, the findings suggest ideas for teaching Business Mathematics that deserve development and testing. Table 3 sets out seven instructional elements that follow from participants' accounts, the themes on which each is based, and the current status of the evidence. These elements are derived from what participants described as unhelpful or missing in their own experience; they are not interventions whose effectiveness has been demonstrated in this study. Some related evidence exists, such as a systematic review in which all nine included instructional interventions reported reductions in mathematics anxiety, although the review also noted that little such work has been done in Sub-Saharan Africa (Luneta & Sunzuma, 2022), and we located no study that has tested these elements with business students in Rwandan private higher education. The elements address both the affective and the instructional sources of anxiety that participants identified, and they could be tested in later design-based or experimental studies that measure anxiety and achievement directly.

Table 3: Proposed Instructional Elements, Their Basis in Participants' Accounts, and Evidence Status

Proposed instructional element	Participant accounts that suggest it	Evidence status
(a) Contextualised teaching that starts from authentic business problems (profit, interest, budgeting, costing, taxation, pricing) drawn from Rwandan enterprises and students' own work	Themes 3 and 6: formulas taught without business meaning, although students use similar calculations in shops, accounts, and workplaces	Participant-informed
(b) Scaffolded, well-paced lessons with worked examples, guided practice, and formative checks before high-stakes assessment	Theme 3: fast pace, with one missed step causing loss of the whole lesson	Participant-informed
(c) Psychologically safe classrooms where mistakes are treated as learning, using small-group collaboration, peer tutoring, and low-stakes participation	Themes 2 and 4: ridicule in earlier schooling and fear of laughter or judgement from classmates	Participant-informed
(d) Self-efficacy building through early success experiences, mastery feedback, and links between everyday numeracy and formal mathematics	Themes 2, 6, and 9: self-labelling after failure, despite daily use of numeracy	Rationale from self-efficacy theory (Bandura, 1997)
(e) Reduced assessment anxiety through frequent low-stakes quizzes, varied assessment formats, and test-taking and relaxation strategies	Themes 5 and 7: examination panic and perceived loss of marks	An earlier meta-analysis of treatment studies reported reductions in anxiety (Hembree, 1990)
(f) Integration of mathematics across the business curriculum through coordination with accounting, economics, and statistics lecturers	Themes 10 and 12: spread of difficulty into other modules and concern about work	Participant-informed
(g) Professional development for lecturers on anxiety-sensitive pedagogy	Themes 2 and 3: shouting, ridicule, speed, and procedure-only teaching	School-level evidence links teachers' own anxiety to learner outcomes (Beilock et al., 2010)

Note. "Participant-informed" means that the element follows from what participants described in this study.

Limitations

Several limitations should be considered. First, achievement was explored only through students' perceptions. No grades, test scores, or independent measures of mathematical ability or anxiety were collected. Second, the interviews relied on recalled experiences and on English with Kinyarwanda clarifications, so some touch may have been lost in translation, and the authors' closeness to the setting may have influenced what participants said and how it was interpreted, despite the safeguards described in the Methods.

Conclusion

This study explored mathematics anxiety among Business Mathematics students at a private higher education institution in Rwanda. Participants experienced fear, tension, avoidance, and examination panic, which they linked to earlier schooling, abstract teaching, and fear of peer judgement, and they perceived these experiences as lowering their marks, confidence, persistence, and readiness for work. Because achievement was explored through self-report and no grades or test scores were examined, the study shows how students perceive the influence of anxiety on their achievement. Notably, their low attitudes toward mathematics coexisted with clear recognition that mathematics is basic to their modules and daily responsibilities. Because the study is a small single-site case, the findings are not statistically generalisable, but they offer insights that readers may judge transferable to similar business education settings.

Recommendations

The following recommendations are drawn from participants' accounts. They are suggestions for practice and research:

1. **Lecturers** could consider linking topics to authentic business applications, pacing lessons carefully, using worked examples, and responding to errors constructively, because participants described lessons as abstract, fast-paced, and sometimes punitive when errors were made.
2. **Students** may benefit from practising regularly, forming study groups, seeking help early, and using anxiety-management strategies. The first three respond to the avoidance and reluctance to ask for help that participants described, whereas anxiety-management strategies reflect general guidance and were not evaluated in this study.
3. **Future researchers** should conduct multi-institution studies, measure anxiety with validated scales, collect actual grades or assessment data alongside students' perceptions.

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