

Integrating Mathematics Anxiety Intervention into Advanced Mathematics Teaching: A Teaching Reform Model for Mental Health Education

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Abstract

Advanced Mathematics is a first-year university calculus-based foundational mathematics course in the Chinese curriculum, usually covering limits, continuity, differential calculus, integral calculus and series. Because of its abstract concepts, strict logical language and cumulative knowledge structure, many students experience mathematics anxiety when they enter this course. This study is a model-construction and design-based teaching reform study. It proposes an implementable framework for integrating mathematics anxiety intervention into Advanced Mathematics teaching, while large-scale empirical validation will be conducted in future classroom cycles. The model is organized around five links: anxiety diagnosis, situational activation, stratified collaboration, reflective consolidation and dynamic evaluation. It further translates these links into a three-stage classroom process of low-anxiety entry, cooperative inquiry and reflective transfer. The study does not report completed intervention effects; rather, it offers a practical classroom framework through which mathematical rigor, emotional support and pre-service teacher development can be connected. The proposed model may help teachers make course-based mental health education more concrete and provide a basis for later empirical testing in regular Advanced Mathematics teaching.

Keywords: Advanced Mathematics, Mathematics anxiety, Mental health education, Teaching reform

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1. Introduction

In the Chinese university curriculum, Advanced Mathematics is a first-year foundational mathematics course that usually covers limits, continuity, differential calculus, integral calculus and series. It plays a role similar to that of university calculus and serves as an important gateway to later professional study. Advanced Mathematics is one of the first courses through which many university students encounter the style of thinking required in higher education mathematics. Unlike secondary school mathematics, where students can often rely on familiar procedures, Advanced Mathematics asks them to understand definitions, read symbolic language, follow chains of reasoning and choose methods under changing conditions. The course is therefore not only a test of mathematical knowledge, but also a test of students' confidence, persistence and tolerance of temporary confusion.

Mathematics anxiety refers to tension, worry, avoidance or negative self-evaluation that appears when learners face mathematical learning, assessment or application situations. Since Richardson and Suinn (1972) developed the Mathematics Anxiety Rating Scale, research has repeatedly shown that mathematics anxiety is closely related to learners' achievement, working memory, attitudes and course choices (Hembree, 1990; Ashcraft, 2002; Dowker et al., 2016). In Advanced Mathematics, this anxiety is often triggered by the first encounter with formal concepts such as the epsilon-delta definition of limit, the distinction between continuity and differentiability, or the choice of convergence tests for series.

In actual classrooms, anxiety often appears earlier than failure. A student may stop asking questions before the teacher notices a serious knowledge gap; another may copy a complete solution but still feel unable to explain why a method is valid. If such experiences accumulate, students may interpret difficulty as evidence that they are not suited to mathematics. This interpretation can lead to avoidance, superficial practice and a cycle in which lower participation further weakens learning.

For teacher education universities, the issue has an additional meaning. Pre-service teachers are current learners of Advanced Mathematics, but they are also future educators who will meet pupils with similar fear, embarrassment and avoidance in mathematics classrooms. Their own experience of supportive mathematical learning may shape how they later interpret pupils' mistakes and emotional responses. Integrating mental health education into Advanced Mathematics is therefore not a decorative addition to the course; it is a way to connect mathematical learning, psychological development and teacher professional preparation.

2. Problem Statement and Research Questions

Traditional Advanced Mathematics teaching in many Chinese universities still relies heavily on a lecture-centered sequence of definition, theorem, example and exercise. This sequence is efficient for delivering content, especially in large classes with a tight syllabus, but it is less sensitive to the emotional process through which students enter abstract knowledge. When students are given limited time to express partial understanding, compare methods or revisit errors, mathematical difficulty is easily transformed into psychological pressure.

At the same time, course-based mental health education is often discussed in general terms, while specific classroom paths in mathematical courses remain insufficiently developed. Psychological support cannot be simply moved into a mathematics class as a separate lecture. It must be embedded in the way concepts are introduced, questions are organized, errors are handled and feedback is given. The central problem of this study is therefore how to build a teaching model that keeps the rigor of Advanced Mathematics while making students' anxiety visible, manageable and educationally useful.

The study is justified by three practical needs. The first is the need to improve learning quality in a course that often influences students' confidence in later professional study. The second is the need to make mental health education concrete at the course level. Students do not experience anxiety in the abstract; they experience it when a definition suddenly becomes formal, when a solution is displayed too quickly, or when a test result seems to define their ability. The third need is teacher education. If pre-service teachers only remember Advanced Mathematics as pressure, they may reproduce the same pressure in future classrooms. If they experience a mathematically rigorous but emotionally supportive course, they gain a living example of how mathematics teaching can be both demanding and humane.

The study addresses three questions. First, what sources of mathematics anxiety are most closely connected with the learning characteristics of Advanced Mathematics? Second, how can teachers design a classroom model that integrates cognitive scaffolding with mental health education without weakening mathematical standards? Third, what evaluation mechanism can help teachers judge whether the intervention improves students' learning engagement, emotional experience and professional development as pre-service teachers?

3. Review of Related Literature

Research on mathematics anxiety has moved from describing a negative emotional state to explaining how cognition, emotion and achievement influence one another. Ashcraft (2002) argued that anxiety can occupy working-memory resources needed for mathematical processing. Hembree's (1990) meta-analysis also showed a stable negative relation between mathematics anxiety and achievement. More recent reviews emphasize that the relation is not one-way: weak performance may intensify anxiety, and anxiety may in turn reduce later performance (Dowker et al., 2016; Ramirez et al., 2018). This bidirectional view is particularly useful for Advanced Mathematics, where temporary failure is common even among students with acceptable mathematical backgrounds.

Studies of intervention suggest that reducing mathematics anxiety requires more than encouragement. Students need opportunities to rebuild meaning, experience success at an appropriate level and reinterpret mistakes as information rather than as personal judgment. Beilock and Maloney (2015) noted that mathematics anxiety has consequences for both achievement and participation in STEM-related learning. From the perspective of self-efficacy, students' belief that they can organize and carry out a learning action is itself part of later performance (Bandura, 1997). Boaler (2016) similarly emphasized that classroom messages about ability and errors influence students' willingness to engage with challenging mathematical tasks. These findings imply that an effective intervention should be built into ordinary teaching routines instead of being reserved for students already considered problematic.

Experiential learning and cooperative learning provide practical support for this classroom-level intervention. Kolb (1984) described learning as a cycle of experience, reflection, abstraction and application. For abstract topics in Advanced Mathematics, a brief situation, graph, numerical table or professional example can help students form an initial image before the formal definition appears. Johnson and Johnson (1999) showed that cooperative learning can strengthen positive interdependence and individual accountability. In a large mathematics class, carefully designed group roles can give anxious students a safer first step into participation.

Policy documents in China also require universities to strengthen both curriculum construction and student mental health work. The Guidelines for Curriculum Ideological and Political Construction in Higher Education encourage teachers to explore the educational value of each course (Ministry of Education of the People's Republic of China, 2020). The special action plan on student mental health work further calls for more systematic support in educational settings (Ministry of Education of the People's Republic of China et al., 2023). These policy directions make it necessary to study mental health education not as an external service alone, but also as part of disciplinary teaching reform.

International assessment reports also remind educators that mathematical achievement cannot be separated from students' attitudes, confidence and opportunities to learn. OECD (2023) reported considerable differences in mathematics performance and learning experience among students from different backgrounds. Although Advanced Mathematics in Chinese universities has its own curriculum context, this broader evidence suggests that a course design attentive to both cognition and emotion is not a local concern only, but part of a wider conversation about equitable mathematics learning.

Recent studies further support the need to attend to mathematics anxiety in university-level STEM learning. Barroso et al. (2021) synthesized a large body of research and confirmed a consistent negative relation between mathematics anxiety and mathematics achievement. Daker et al. (2021) followed first-year university students and found that mathematics anxiety predicted later STEM avoidance and underperformance even after controlling for mathematics ability. These findings caution against treating anxiety as a secondary issue that can be addressed only after achievement problems appear.

At the level of classroom practice, formative assessment and curriculum-embedded wellbeing work also provide useful support for the present model. Double et al. (2020) showed that peer assessment can function as a formative practice across educational contexts, which is relevant to the peer evaluation and role-sharing elements of the proposed model. Lister and Allman (2024) argued that mental wellbeing in higher education needs to be embedded in curriculum practice rather than left only to external services. These recent studies strengthen the rationale for integrating emotional support into the ordinary routines of Advanced Mathematics teaching.

Conceptually, mathematics anxiety is better treated as a context-sensitive response than as a single fixed personal attribute. It may appear as anticipatory worry before class, tension during symbolic manipulation or fear of evaluation, and these forms need not move together. Short instruments such as the Abbreviated Math Anxiety Scale provide a practical screening option (Hopko et al., 2003), but scores should be interpreted together with task-specific evidence. Cipora et al. (2022) similarly emphasize the interaction among the learner, the mathematical task and the learning context. For Advanced Mathematics, this distinction matters: a student who manages routine differentiation may still become highly anxious when asked to explain a formal definition or choose among several convergence tests.

Mechanism-focused research also indicates that the relation between anxiety and performance is reciprocal. Worry can consume working-memory resources during problem solving, while repeated difficulty and negative feedback can strengthen later anxiety (Carey et al., 2016). At university level, the consequences may extend beyond a single test. Jenifer et al. (2023) found that mathematics anxiety was associated with avoidance-related experiences in college calculus, showing why participation, persistence and course choices deserve attention alongside scores. This evidence supports diagnosis at multiple points in the course rather than only before a final examination.

The intervention literature suggests that no single technique is sufficient for all learners or all course situations. Expressive writing before a high-pressure mathematics task can reduce the intrusive thoughts that interfere with performance (Park et al., 2014), whereas classroom-based programs may combine strategy instruction, repeated successful practice, cognitive reappraisal and supportive feedback. Meta-analytic evidence shows that interventions can reduce mathematics anxiety, although effects vary with participants, duration and intervention type (Sammallahti et al., 2023; Liu et al., 2026). Importantly, reduced anxiety and improved achievement are related but distinct outcomes; a useful evaluation should therefore examine both rather than assume that change in one automatically proves change in the other.

Taken together, the literature supports task-specific diagnosis, timely reduction of avoidable pressure, rigorous practice and repeated feedback. Much research still measures general anxiety or a short, separate intervention; fewer studies translate the evidence into recurring university calculus routines in teacher education. The five links proposed here address that practice-oriented gap.

4. Conceptual Framework

The conceptual framework of this study is based on a cognitive-affective cycle in Advanced Mathematics learning. When students meet an abstract concept without enough prior support, they may experience cognitive overload. Cognitive overload can produce anxiety; anxiety can reduce working memory and participation; reduced participation can lead to weaker understanding; weaker understanding then confirms the student's belief that mathematics is beyond his or her ability. The cycle is not fixed, but it becomes strong when teaching treats mistakes only as incorrect results rather than as diagnostic signals.

The proposed intervention acts on three points in this cycle. The first point is the entrance to a new concept. Situational activation and visual representation help students approach formal language with less fear. The second point is the process of construction. Stratified collaboration and role division provide different paths for students with different foundations to participate in the same lesson. The third point is feedback after practice. Error analysis, reflective journals and second submission help students separate a temporary mistake from a fixed judgment about ability.

This framework directly informs the five links of the model. Anxiety diagnosis identifies where the cognitive-affective cycle begins; situational activation lowers the threshold of entry; stratified collaboration sustains participation during concept construction; reflective consolidation helps students reinterpret errors; and dynamic evaluation feeds these observations back into the next round of teaching design.

The framework also includes the professional identity of pre-service teachers. When a student designs a simple explanation of a limit for a future pupil, or writes feedback to a hypothetical anxious learner, the student is no longer only solving a mathematical problem. He or she is also learning how mathematical emotions are produced and how they may be supported. In this sense, Advanced Mathematics becomes a site where knowledge learning and teacher education can reinforce each other.

5. Methodology

5.1 Research design

This study adopts a model-construction and design-based teaching reform approach. It does not report a completed large-scale intervention experiment; rather, it develops a classroom framework that can be implemented, observed and revised in regular Advanced Mathematics teaching. The purpose is to make mathematics anxiety intervention operational within disciplinary teaching instead of treating it as an external psychological service.

5.2 Teaching context and design procedure

The target teaching context is the large-class Advanced Mathematics course commonly offered to first-year undergraduates in teacher education universities. The model is especially suitable for chapters such as limits, derivatives, integrals and series, where formal concepts and procedural methods appear together. The design process included four steps: analyzing difficult knowledge points and common student errors; reviewing research on mathematics anxiety, experiential learning, cooperative learning and formative assessment; redesigning classroom routines so that emotional support is attached to mathematical tasks; and preparing an evaluation framework for later classroom cycles.

For transparency, the model-building review was analytic rather than an exhaustive systematic review. Following integrative review guidance (Snyder, 2019), sources were charted by four questions: what situation activates anxiety, what mechanism is involved, what response is supported, and what observable change could indicate improvement. These categories were compared with typical difficulty points in limits, derivatives, integrals and series so that general findings were linked to recognizable course tasks.

The analysis then followed a situation-mechanism-routine-indicator chain. Unfamiliar epsilon-delta notation, for example, was coded as a formal-language entry barrier; the likely mechanism was cognitive overload combined with fear of public error; the routine was an intuitive representation followed by group translation into symbols; and the indicators were willingness to attempt the task, explanation quality and reported tension. A routine was retained only if it was consistent with the literature, aligned with the mathematical objective, feasible in a large class and supported by collectable evidence. This reflects the connection between theory, design and practice in design-based research (Design-Based Research Collective, 2003), while the study remains at the initial construction stage.

5.3 Possible data sources for future implementation

Although the present article focuses on model construction, it specifies possible evidence sources for subsequent empirical work. These sources may include a short mathematics anxiety scale, classroom observation records, homework and error notebooks, learning journals, interviews, peer evaluation sheets and unit learning outcomes. Such evidence can be collected before, during and after implementation to examine how students' anxiety, participation and conceptual understanding change across teaching cycles.

In a future pilot, analysis should start with a baseline profile of anxiety, prior achievement and participation. Pre-test and post-test differences may be reported with effect sizes and confidence intervals, while repeated records can show whether change is gradual, topic-specific or temporary. Qualitative materials should be coded for triggers, coping responses, participation patterns and conceptual turning points, then compared across students and sources. Agreement among scale scores, observations, error notebooks and interviews would strengthen an interpretation; disagreement and negative cases should be retained because a routine may help one group but pressure another.

5.4 Ethical considerations and credibility

Because the model involves students' emotional experience, ethical considerations are central. Anxiety diagnosis should be used to improve teaching and provide support, not to rank or label students. Questionnaires and learning journals should be handled anonymously when possible, and public discussion of errors should protect students' dignity by using anonymous examples or teacher-prepared materials. To strengthen credibility, later implementation should triangulate quantitative evidence from scales and tests with qualitative evidence from classroom observation, student reflection and teacher logs.

6. Construction of the Integrated Teaching Model

The model is designed with three main objectives. First, it aims to lower students' initial anxiety when they enter abstract concepts and to increase their willingness to participate. Second, it aims to support students' understanding of the relation between concepts, methods and application situations. Third, it aims to support pre-service teachers in forming a future-oriented awareness of mathematics anxiety intervention.

The model is organized around five links: anxiety diagnosis, situational activation, stratified collaboration, reflective consolidation and dynamic evaluation. Anxiety diagnosis identifies the points at which students feel pressure. Situational activation gives students an accessible entrance to a formal concept. Stratified collaboration allows students at different levels to work on related tasks. Reflective consolidation helps students review errors, strategies and emotional changes. Dynamic evaluation connects the information gathered from teaching back to the next round of lesson design.

In classroom operation, the five links are expressed through a three-stage progressive activity structure. The word progressive is important: students are not expected to move from fear to confidence in one lesson. Rather, the model creates repeated low-risk opportunities for students to speak, try, revise and transfer. Table 1 presents the classroom structure.

In this structure, the five links are not isolated procedures. Anxiety diagnosis informs the choice of entry task, situational activation prepares the first stage, stratified collaboration supports the second stage, reflective consolidation organizes the third stage, and dynamic evaluation connects the whole process with the next lesson.

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Table 1. Three-stage progressive classroom activity structure

Stage	Teaching focus	Typical classroom activities	Anxiety intervention function
Stage 1: Low-anxiety entry	Lower the threshold of abstract concepts and activate prior experience.	Short situation, visual demonstration, historical note, intuitive question or professional application.	Reduces the pressure caused by a direct formal definition and allows students to express initial ideas in ordinary language.
Stage 2: Cooperative inquiry and construction	Guide students from intuitive experience to conceptual structure and method selection.	Stratified group tasks, role division, variation of examples, peer explanation and error diagnosis.	Uses peer support to reduce the risk of public expression and turns errors into shared learning resources.
Stage 3: Reflective transfer and improvement	Help students consolidate methods, transfer knowledge and regulate learning strategies.	Learning journal, second submission, open-ended exercise, micro-lesson design and peer evaluation.	Encourages students to identify anxiety triggers and build sustainable strategies for later learning.

Four operating principles should be observed in using the model. First, the knowledge mainline cannot be weakened. Anxiety intervention is meaningful only when it helps students understand limits, derivatives, integrals and series more deeply. Second, psychological support should be universal rather than labeling. The teacher should not publicly separate anxious students from non-anxious students, because such a division may create new pressure. Third, classroom activities must serve conceptual understanding. A group discussion that does not return to the mathematical object soon becomes a formality. Fourth, evaluation should be developmental. Teachers should pay attention not only to right answers, but also to the path through which students correct errors and regain willingness to continue.

The relation between the five links and the three stages can be adjusted according to the lesson. For a new concept, situational activation may take more time; for a review lesson, reflective consolidation may become the central task; before an examination, dynamic evaluation and anxiety regulation may be more urgent. This flexibility is important because Advanced Mathematics is not a uniform course. The difficulty of a limit definition, a derivative application and a series convergence test is different, and students' emotional responses are also different.

7. Implementation Pathways in Advanced Mathematics Teaching

The first pathway is to build an anxiety-cause map before and during teaching. At the beginning of a semester, teachers can use a short mathematics anxiety questionnaire, a learning background survey and one open question about the most worrying part of Advanced Mathematics. During the semester, exit tickets, learning journals and common error records can be used to update the map. The map should focus on situations rather than identities: for example, anxiety about symbolic definitions, anxiety about public questioning, anxiety about proofs, or anxiety about examination time.

A practical anxiety-cause map can be very simple. Teachers may list the main knowledge points in a chapter and mark the type of difficulty that students report most often: concept image unclear, symbol translation difficult, method choice unstable, proof language unfamiliar, or examination pressure high. This map then guides lesson design. If the problem is symbol translation, the teacher prepares more language conversion tasks; if the problem is method choice, the teacher prepares comparison examples; if the problem is fear of public mistakes, the teacher begins with anonymous responses.

The second pathway is to use brief and accurate situational introductions. A situation should not take over the lesson; it should make the formal idea easier to enter. In teaching limits, for instance, a teacher may first show a sequence of positions approaching a target and ask whether approaching means arriving. Students can then discuss whether an error can be made smaller than any given standard. Only after this discussion does the epsilon-delta language appear. The situation is therefore not a story placed before mathematics, but a bridge into the logic of the concept.

The third pathway is stratified collaboration. In a large class, group work can easily become formal unless tasks are carefully layered. For a lesson on series convergence, the basic task may ask students to distinguish the statement that terms tend to zero from the statement that the series converges. The application task may require students to choose among comparison, ratio and root tests. The extension task may ask students to explain why a wrong test choice looks reasonable at first. Students with higher anxiety can begin as recorders, question collectors or example checkers, and gradually move toward explanation roles.

The fourth pathway is regular error analysis. In many mathematics classes, errors are corrected too quickly. Students see the correct solution but do not understand the source of the incorrect one. Under the proposed model, typical errors are selected and discussed as learning materials. For example, when students confuse average rate of change with instantaneous rate of change, the teacher can guide them to compare the meanings of secant slope and tangent slope rather than simply mark the result as wrong. This process helps students understand that an error often has a structure and can therefore be repaired.

The fifth pathway is to connect mathematical learning with teacher preparation. For pre-service teachers, a reflective task may ask them to redesign a difficult concept for younger learners or to write a short teacher response to a student who says, 'I am not a mathematics person.' Such tasks do not replace mathematical exercises; they help students recognize the educational meaning of the exercises. When students learn how their own anxiety can be reduced through support, they are more likely to provide similar support in future classrooms.

These pathways should be used with restraint. A classroom full of activities may still fail if students do not have enough quiet time to think. A psychologically warm classroom may still be ineffective if the mathematical connections are unclear. The teacher's professional judgment is therefore essential. The model provides a structure, but the quality of implementation depends on whether the teacher can notice students' responses and adjust the rhythm before anxiety turns into withdrawal.

7.1 An Illustrative Lesson: Introducing the Epsilon-Delta Definition of Limit

An illustrative example can be found in teaching the epsilon-delta definition of limit. Before presenting the formal definition, the teacher may use a visual sequence of points approaching a fixed target and ask students to discuss whether "getting closer" is the same as "arriving." This low-anxiety entry allows students to express intuitive ideas in ordinary language before they face formal symbols.

In the cooperative inquiry stage, groups are asked to translate informal statements such as "the error can be made very small" into more precise mathematical language. Students with different levels of confidence may take roles such as recorder, question collector, symbol translator or explanation presenter. The teacher then guides the class to connect the intuitive idea of controllable error with the relation between epsilon and delta, so that formal rigor grows out of shared discussion rather than appearing as a sudden obstacle.

In the reflective transfer stage, students write a short journal explaining which part of the definition caused anxiety and how the group discussion helped them understand it. Pre-service teachers may further design a short explanation for a younger learner who is afraid of formal symbols. In this way, mathematical rigor, emotional support and teacher education are connected in a single classroom routine.

8. Evaluation and Feedback Mechanism

Evaluation of the model should be understood as a framework for future validation rather than as a report of already obtained intervention results. It should avoid a narrow focus on final examination scores. A student may show changes in participation, persistence and conceptual explanation before those changes are fully reflected in a summative test. Therefore, later classroom cycles should collect evidence from cognitive, emotional, behavioral and developmental dimensions. Table 2 shows an index system that can be used by course teams.

Table 2. Evaluation index system for mathematics anxiety intervention

Dimension	Core indicators	Data sources	Use of feedback
Cognitive	Conceptual understanding, method selection, reasoning quality and knowledge transfer.	Classroom quizzes, homework analysis, unit tests and error notebooks.	Locate knowledge breakpoints and adjust explanation order, examples and practice levels.
Emotional	Mathematics anxiety, self-efficacy, learning confidence and willingness to ask questions.	Short anxiety scale, learning journals, interviews and anonymous exit tickets.	Identify high-anxiety points and provide timely support without labeling students.
Behavioral	Task completion, group participation, question frequency and persistence after errors.	Classroom observation, group records, platform logs and peer feedback.	Improve group organization and create entry roles for quiet or anxious students.
Developmental	Reflective ability, teaching awareness, cooperative competence and future intervention awareness.	Reflection reports, micro-teaching tasks, lesson redesign and peer evaluation.	Support the professional growth of pre-service teachers and refine the teaching reform toolkit.

If conditions permit, a quasi-experimental design can be used in later classroom research. Teachers may compare an experimental class using the integrated model with a comparison class using regular teaching, while collecting pre-test and post-test data on mathematics anxiety, achievement and classroom participation. To avoid overinterpreting average scores, qualitative evidence such as interviews, learning journals and error analyses should be read together with quantitative results.

Feedback should return to teaching quickly. If many students report anxiety about proof language, the next lesson may include a short translation activity from natural language to symbolic language. If group records show that several students remain silent, the teacher may redesign roles so that every student has a small but visible contribution. If learning journals show that students understand a method but do not know when to use it, the teacher may add comparison tasks rather than more exercises of the same type.

In reporting later intervention effects, both improvement and non-improvement should be treated as useful evidence. If anxiety appears to decrease but achievement does not change, the teacher may need to strengthen conceptual practice. If achievement improves while anxiety remains high, the course may still rely too heavily on pressure. If participation increases only among high-achieving students, group roles may need to be redesigned. Such findings can prevent the reform from becoming a slogan and keep it connected with real classroom problems.

9. Discussion

The value of the proposed model lies first in its classroom embeddedness. Mathematics anxiety is often treated as a psychological problem outside the mathematics lesson. This separation is understandable, but it misses the fact that many anxious reactions are produced by concrete teaching moments: a sudden formal definition, a public question, a repeated error, or a test score interpreted as a fixed measure of ability. When intervention is placed inside these moments, support becomes more timely and more closely connected with knowledge learning.

The second value is the balance between rigor and care. Some teachers worry that paying attention to students' emotions may lower academic standards. The model argues the opposite. Students can only enter rigorous mathematical reasoning when they have enough cognitive and emotional support to remain with difficulty. A supportive classroom is not one that avoids abstraction; it is one that gives students a path into abstraction and a way back after mistakes.

The third value is local adaptability. Large-class teaching, tight schedules and examination pressure are real constraints in Advanced Mathematics. The model therefore uses small changes in ordinary teaching routines rather than relying on expensive resources or fully individualized counseling. A five-minute situational entry, a layered task sheet, an anonymous error discussion or a short reflective journal can be inserted into existing lessons with limited disruption. This makes the model easier to try, revise and disseminate among course teams.

This feature is especially important for large-class teaching. In a large class, teachers cannot provide individual counseling to every student during a lesson, but they can design common routines that lower the threshold for participation. Anonymous error collection, clearly assigned group roles, short reflective prompts and layered tasks allow emotional support to be distributed through classroom organization. The model is therefore suitable for settings where teachers must balance syllabus progress, classroom management and student support.

The study also has limitations. It mainly presents a teaching reform model and an evaluation framework; large-scale empirical evidence still needs to be accumulated. Future studies should conduct multiple rounds of implementation, compare effects among students with different majors and mathematical foundations, and examine whether reduced anxiety is sustained after the course ends. Student voices should also be included more fully, because learners may experience the same classroom activity in different ways.

10. Practical Value and Dissemination

The practical value of the model is that it translates mental health education into teachable routines. For a course team, the model can be developed into a small toolkit: a pre-class diagnostic form, a set of situational introduction cases, layered task sheets for major chapters, an error-analysis template, a learning journal prompt bank and an evaluation rubric. These materials can be shared among teachers without forcing every teacher to teach in exactly the same way.

The model can also support teacher development. Young teachers of Advanced Mathematics often feel a conflict between completing the syllabus and responding to students' difficulties. A structured model helps them see where emotional support can be placed without sacrificing content. Senior teachers can use the same model to make tacit teaching experience explicit, such as how to slow down before a formal definition, how to choose a public error for discussion, or how to use a student's partial answer as a starting point for reasoning.

For pre-service teachers, dissemination should include reflection on future classroom use. After a chapter is completed, students may be asked to write a short note on how they would support a middle school learner who is afraid of a similar idea. This task links university mathematics, psychology and pedagogy in a concrete way. It also reminds students that the emotions they experience in learning mathematics can become professional resources rather than private burdens.

11. Conclusion and Recommendations

The main contribution of this study is to translate mathematics anxiety intervention into a set of teachable classroom routines for Advanced Mathematics. By connecting anxiety diagnosis, situational activation, stratified collaboration, reflective consolidation and dynamic evaluation, the model provides a practical path for course-based mental health education without weakening mathematical rigor. The present article should be read as a model-construction and design-based teaching reform study, and its effectiveness still needs to be examined through semester-long or multi-round classroom implementation.

The three research questions can therefore be answered at the model level. First, the sources of anxiety most relevant to Advanced Mathematics are not abstraction alone, but the interaction of formal language, cumulative knowledge gaps, public evaluation, method choice and fixed-ability interpretations of error. Second, an integrated classroom model can respond to these sources through low-pressure entry, stratified participation, explicit error analysis and reflective transfer while keeping conceptual understanding as the main line of the lesson. Third, evaluation should connect cognitive, emotional, behavioral and developmental evidence and return that evidence to the next teaching cycle. These answers provide a coherent design rationale, but they do not yet constitute proof of intervention effectiveness.

For teachers, the first recommendation is to identify the emotional cost of abstract knowledge and to design small supports before students withdraw from participation. For course teams, the second recommendation is to build shared resources such as diagnostic questionnaires, situation cases, layered task sheets, error-analysis materials and reflection templates. For institutions, the third recommendation is to recognize course-based mental health education as part of teaching quality improvement and to provide time and support for collaborative lesson design.

Future research should move from model construction to evidence accumulation. A semester-long or multi-round design can examine how students' anxiety, achievement and participation change over time. Comparative studies across majors may show which groups benefit most from specific forms of support. Research on pre-service teachers should also explore whether experiencing an anxiety-sensitive Advanced Mathematics classroom improves their later ability to notice and respond to pupils' mathematical emotions.

The next stage should therefore test both outcomes and process. In addition to asking whether average anxiety or achievement changes, researchers should examine which teaching routines are actually used, for whom they are helpful, and under which mathematical topics or classroom conditions their effects weaken. Multi-round implementation, comparison across majors and follow-up after the course would help distinguish a temporary sense of comfort from durable changes in participation, strategy use and mathematical confidence. Such evidence would allow the model to be revised without overstating the conclusions of the present design-oriented study.

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