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Building Academic Resilience in Mathematics: Teachers' and School Administrators' Perspectives from Secondary Schools in Quetta, Pakistan

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ABSTRACT

This qualitative study explained the perceptions of teachers and school administrators of secondary school students regarding academic resilience in mathematics in Quetta. The semi-structured interviews were conducted from 20 participants which includes 10 mathematics school teachers and 10 school administrators from public and private secondary schools. The data were analyzed by using thematic analysis through which four major themes were identified (1) Socio-Economic and Cultural Barriers to Academic Resilience in Mathematics, (2) Pedagogical Strategies and Teacher Efficacy, (3) Institutional Support and Leadership Practices, (4) Student Mindset and Community Engagement. The findings indicate that academic resilience in mathematics is influenced by the interaction of individual, pedagogical, institutional, and contextual factors. According to these findings, the study proposes Quetta Mathematics Resilience Framework (QMRF) to provide a context-specific understanding of resilience in mathematics. The study offers practical implications for teachers, school leaders, and policymakers and contributes to growing literature on mathematics education and academic resilience in developing educational areas.

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Introduction

Mathematics is an important subject that supports students' academic development and prepares them for higher education and them for their future careers. The success in mathematics is related with problem-solving, logical reasoning, and participation in science, technology, engineering, and mathematics (STEM) fields (Schoenfeld, 2014). Although mathematics is very important subject, but many students in developing countries experience challenges in learning mathematics. Similarly, in Pakistan, mathematics achievement remains a major concern, here many students are demonstrating low performance and negative attitudes toward mathematics (Hussain et al., 2020). In Quetta, these challenges are further influenced by limited educational resources, socio-economic conditions, and the diverse cultural context in which schools are operated. Understanding these contextual factors, it is important to identify the ways to support students' learning and resilience in mathematics.

Academic resilience, defined as the capacity or student's ability to continue learning and achieving academic success high levels of achievement and motivation despite exposure to adverse circumstances (Martin & Marsh, 2006), offers a promising lens for understanding how some students succeed in mathematics despite these challenges. While resilience research has predominantly focused on Western contexts, there is a growing recognition that resilience is culturally embedded and contextually situated (Ungar, 2012). This study addresses the critical gap in understanding how mathematics teachers and school leaders in Quetta perceive, conceptualize, and foster academic resilience among secondary school students.

Many efforts have been made to bring improvement in mathematics education in Pakistan, but students' performance remains the same that experience the difficulties while learning mathematics. According to research number of challenges like limited educational resources, shortages of qualified teachers, and differences in learning opportunities affect students' mathematics achievements and their performance consistently which lags behind Baluchistan from other provinces (Ali et al., 2017; Hussain et al., 2020). Furthermore, less attention has been given to the psychological and social factors that can help students to cope up with these challenges. In particular, there is another problem of limited understanding about the development of students' academic resilience in mathematics and how schools are helpful to support this process.

However, the school teachers and leaders play an important role for developing learning environments that encourage students to overcome academic difficulties. Their experiences, classroom practices, and leadership approaches provide valuable insights which can create academic resilience in mathematics learning in students. However, their perspectives have received limited attention in the existing literature, especially in the context of secondary schools in Quetta. Exploring these perspectives can contribute to a better understanding about how schools can support students' success and participation in mathematics.

Research Objectives

1. To explore how secondary school mathematics teachers and school leaders in Quetta understand academic resilience in mathematics.
2. To identify the factors that teachers and school administrators perceive as promoting academic resilience in mathematics.
3. To examine the strategies used by teachers and school administrators that enhance academic resilience among secondary school students in mathematics.
4. To explore the role of school administrators in creating a supportive school environment that promotes academic resilience in mathematics.
5. To develop a contextually grounded framework for promoting academic resilience in mathematics among secondary school students of Quetta.

Research Questions

1. How do secondary school mathematics teachers and school administrators of Quetta understand academic resilience in mathematics?
2. What factors do mathematics teachers and school administrators perceive as promoting academic resilience among secondary school students?
3. What strategies do mathematics teachers and school administrators use to enhance academic resilience in mathematics?
4. How do school administrators contribute to creating a supportive school environment that promotes academic resilience in mathematics?
5. How can the perspectives of teachers and school administrators inform a contextually grounded framework to promoting academic resilience in mathematics in Quetta?

This study contributes in existing literature by providing insights into how mathematics teachers and school administrators support academic resilience among secondary school students of Quetta. It highlights the experiences and perceptions of the educators who are working in a context where students face multiple range of educational and social challenges. The findings also revealed practical suggestions for mathematics teachers, school administrators, and policymakers to strengthen supportive school environments and promote students' resilience in mathematics learning. By focusing on the educational context of Quetta, this study adds to the limited research on academic resilience in mathematics in Pakistan and may inform future research in similar educational settings.

Literature Review

Academic Resilience in Mathematics

Academic resilience defines the students' ability to continue learning and achieving well despite experiencing different academic challenges or setbacks. The concept developed from the broader idea of resilience theory in psychology, which describes a person's ability that adapt positively when facing difficulties and challenges (Masten, 2001). In education, academic resilience is viewed as a dynamic process that has been influenced by both personal qualities and supportive learning environments from families, teachers, peers and schools rather than being a fixed personal characteristic (Rutter, 2012).

Martin and Marsh (2006, 2008) described that academic resilient students have a combination of some learning characteristics that includes self-efficacy, a sense of control, planning, and persistence. Their studies showed that academically resilient students remain motivated, continue making an effort, and use effective learning strategies even when they face academic challenges. Later studies further emphasized that academic resilience develops through interactions between students, with their teachers, families, peers, and schools (Ungar, 2012; Theron et al., 2014).

In mathematics, resilience means the students who continuously try to solve difficult problems even when they make mistakes or experience failure (Boaler, 2016; Dweck, 2006). Johnston-Wilder and Lee (2015) described mathematical resilience as a positive attitude that helps students keep learning mathematics while having challenges. They emphasized that encouraging teachers and supportive classroom environments are important for development of confidence and persistence in mathematics learning (Kooken et al., 2016).

Mathematics Education in Pakistan: Contextual Challenges

Pakistan’s education system continuously facing systemic challenges that includes low enrollment, high dropout rates, inadequate infrastructure, and teacher quality concerns (Andrabi et al., 2008). However, these challenges have also affected the students’ mathematics education. Studies have shown that mathematics teaching in many Pakistani schools is largely based on route memorization and routine procedures, with less emphasis on conceptual understanding and problem-solving skills (Halai, 2011; Hussain et al., 2020).

However, the province of Baluchistan faces

additional challenges. It is Pakistan's largest but least populated province, with significant rural and remote populations. The access in education in many remote areas is limited, which cannot access to quality the education that's seems difficult for most of the students (Khan, 2017). Schools of some areas faced challenges related to shortages of trained teachers, limited learning resources, and socio-economic conditions, and these all influence students' learning experiences. These related factors make it important to understand that how teachers and school administrators can support students in developing academic resilience in mathematics.

The Role of Teachers in Building Academic Resilience

The teachers play valuable role in developing students' academic resilience in mathematics through effective teaching practices, continuously encouragement, and constructive feedback. These practices help to build students' confidence and motivate students to continue learning even when they faced challenges. Teachers who believe that mathematical ability can improve by their effort are more likely to encourage persistence and positive attitudes toward learning mathematics (Dweck, 2006; Horn, 2007).

In developing countries, including Pakistan, mathematics teachers often work in schools with limited resources and large class sizes. The mathematics teachers frequently lack adequate training and resources, yet many demonstrate remarkable adaptive expertise in responding to contextual constraints. Despite facing challenges, teachers continue to support students by adapting their teaching methods to meet students' learning needs. Understanding teachers' perspectives and classroom practices is important to identify the effective ways to promote academic resilience in mathematics, particularly in contexts such as Quetta.

School Leadership and Resilient Learning Environments

School leaders play a crucial role in creating significantly learning environment that provide support to the student in academic resilience. The effective leadership practices help to build a positive school culture, supports teachers, and creates conditions where students feel encouraged to learn and overcome the academic challenges. Research has shown that school administrators are associated for the improvement of teaching quality and better student learning outcomes (Leithwood et al., 2004; Robinson et al., 2008).

In challenging educational setups, the school administrators adopt those practices which are required for the need of school and the society. Clarke and O'Donoghue (2017) argue that effective school administrators should understood within its educational and social context, as leadership practices are shaped by the circumstances in which schools operate. This perspective is particularly significant to secondary schools in Quetta, where school administrators play a pivotal role in supporting teachers and creating environments that encourage students' resilience in mathematics.

Theoretical Framework

This study is based on two theories Social Ecological Resilience Theory (Ungar, 2017) and the Transformative Social and Emotional Learning (T-SEL) Framework (CASEL, 2020). By combining these theories, it indicates a useful foundation for understanding that how academic resilience in mathematics is developed through supportive relationships, school practices, and the learning environment.

Ungar's (2017) Social Ecological Resilience Theory explains that resilience is not an individual trait but it is the build by the interaction between students and their social learning environment. According to this perspective, students are more likely to reduce the academic challenges when they have access of supportive teachers, positive peer relationships, effective school leadership, and learning opportunities that fulfill students' needs. These theories are relevant to the present study because it highlights the role of schools and stakeholders that help students in developing academic resilience in mathematics.

The Transformative Social and Emotional

Learning (T-SEL) Framework (CASEL, 2020) describes the significance of creating inclusive, supportive, and equitable learning environments where every student feels safe, being respected, and encouraged for learning and achievement. This framework indicated the positive relationships, a sense of belonging, and emotionally teaching practices that strengthen students' confidence, motivation, and their persistence. These qualities are much related to academic resilience, especially in mathematics, where students mostly face challenging learning experiences.

By using these theories, this study explores that how mathematics teachers and school administrators understand the mathematical academic resilience. According to these theories the factors which influence the development, and the strategies are being used to support students in reducing challenges in mathematics. Moreover, these theories also provide a framework for interpreting the findings and understanding about school environment and their contribution towards students' resilience in the context of secondary schools in Quetta.

Research Gap

In recent years' research on academic resilience and mathematics education has been increased gradually, but still several gaps are not identified. Much of the existing research has been conducted in developed countries, while studies from developing contexts are still limited. It has been observed that there is limited research on academic resilience in mathematics within the educational context of Quetta.

Moreover, previous studies have largely focused on students' academic outcomes, with less attention towards the perspectives of mathematics teachers and school administrators. By understanding that how educators perceive academic resilience and the strategies they use to support students can provide valuable understandings for improving mathematics learning.

Furthermore, the educational context of Baluchistan presents the unique challenges, which include limited educational resources, geographical barriers, and socio-economic limitations. However, these contextual factors have received limited attention in research on academic resilience in mathematics. This study addresses the gaps by exploring the perceptions of mathematics teachers and school administrators and by examining that how academic resilience can be developed among secondary school students in Quetta.

Research Methodology

Research Design

This study adopted a qualitative research design to discover that how mathematics school teachers and administrators understand and support academic resilience among secondary school students of Quetta. The qualitative approach was considered appropriate because it provides a valuable deeper understanding of participants' experiences, perceptions, and practices. The data for this study were collected through semi-structured interviews from mathematics teachers and school administrators, which allowed participants to share their perceptions in detail and also provide opportunity for the researcher flexibility to ask follow-up questions. The interview data were analyzed using thematic analysis to identify common themes related to academic resilience in mathematics learning (Creswell & Poth, 2018).

Research Context

The study was conducted in the capital city of Baluchistan. However, Quetta is an important educational center in the province and it has both public and private secondary schools. The schools serve students from different social, cultural, and economic backgrounds. Like other cities of Baluchistan, the schools in Quetta face different challenges such as limited educational resources, differences in school facilities, and varying learning opportunities. However, the current conditions of city it make Quetta a suitable setting for exploring how mathematics teachers and school leaders support the development of academic resilience among secondary school students.

Participant Selection

Participants were selected by using purposive sampling because they had direct teaching experience in mathematics or leading secondary schools. The study involved 20 participants, which comprises on 10 mathematics teachers and 10 school principals from different public and private secondary schools in Quetta.

The participants were selected due to their knowledge and experience related to mathematics teaching practices, school leadership, and student learning. Including both teachers and school principals provided diverse perspectives on those factors that influence academic resilience in mathematics and are those strategies which are helpful to support students in overcoming academic challenges.

Data Collection

The data were collected through teachers and principals individual through semi-structured interviews with the selected participants from different secondary schools. Each interview was conducted approximately 45 to 75 minutes and was conducted in Urdu or English as per participant's own choices. Moreover, with the consent of participants', all interviews were audio-recorded which were later transcribed verbatim for analysis.

The interview guide was developed after reviewing the relevant literature and the related theoretical framework. The interview questions explored participants' point of views on academic resilience in mathematics, the major factors that support or limit the resilience, the strategies used to help students, the role of school administrators, and the challenges that promote academic resilience among secondary school students.

Before collecting the main data, pilot interviews were conducted with one mathematics teacher and one school principal that assess the clarity and relevance of the interview questions. According to their feedback, minor revisions were made for the improvement of interview protocol. Moreover, the selected participants for pilot testing were not added in the final study.

Table 1: *Demographic Characteristics of the Participants (N = 20)*

Characteristic	Category	Frequency
Role	Mathematics Teacher	10
	School Principal	10
Gender	Male	12
	Female	08
School Type	Public	10
	Private	10
Qualification	Bachelor's	3
	Masters	8
	Masters with B.Ed/M.Ed	9
Professional Experience	1-5years	2
	6-10years	5
	11-15years	5
	15-20years	6
	Above 20years	2

Table 1 presents the demographic characteristics of the 20 selected participants, comprising 10 mathematics teachers and 10 school principals from public and private secondary schools in Quetta. The sample consisted of 12 male and 8 female participants. Participants had diverse educational qualifications, ranging from bachelor's degrees to master's degrees with professional teaching qualifications. Their professional experience ranged from 1 to more than 20 years, which provide a wide range of perspectives on academic resilience in mathematics.

Data Analysis

The interview data were analyzed using thematic analysis by following six-step approach proposed by Braun and Clarke (2006, 2019). First, all interview recordings were transcribed and read several times to become familiar with the data provided by the partcipants. Next, important ideas and statements related to the research questions were identified and assigned initial codes. Further, the similar codes were then grouped to develop themes. The themes were reviewed and refined to ensure they accurately reflected the participants' responses. Finally, each theme was clearly defined and supported with relevant quotations from the interviews for the findings.

Trustworthiness

The trustworthiness of the study was enhanced by following recognized qualitative research procedures (Lincoln & Guba, 1985). The credibility was held by using semi-structured interviews, audio-recording the interviews by taking participants' consent, and preparing verbatim transcripts for analysis. Transferability was enhanced by providing a clear description of the research setting, participants, and data collection procedures. Moreover, the dependability was ensured by following a systematic process of thematic analysis and documenting each stage of the analysis. Conformability was sustained by making sure that the findings were based on participants' responses and supported with direct quotations from the interviews.

Ethical Considerations

Ethical principles were followed throughout the study. However, before conducting the interviews, all participants were informed about the purpose of the study. Participation was entirely voluntary, and they were informed that they could withdraw from the study at any stage without any consequences. To protect participants' privacy, their identities were kept confidential, and codes were used instead of names in the interview transcripts and reporting of the findings of the study. All interview recordings and transcripts were stored securely. During the interviews, participants were treated with respect, and their views and experiences were recorded without biasness or judgment.

Findings

The thematic analysis identified four major themes, each comprising into on several sub-themes. These themes reflect the views and the experiences of the mathematics teachers and school administrators regarding the academic resilience in mathematics in Quetta.

Theme 1: Socio-Economic and Cultural Barriers to Mathematical Resilience

This theme addresses the social, economic, and cultural challenges that influence the students' ability to develop academic resilience in mathematics learning. The Participants of the study explained that factors such as financial problems, limited educational resources, and family responsibilities often reduce students' motivation and opportunities to succeed and engage in mathematics learning.

Table 2: *Socio-Economic and Cultural Barriers to Mathematical Resilience*

Theme	Sub-Theme	Key Codes	Representative Quote
Theme 1: Socio-Economic and Cultural Barriers to Academic Resilience in Mathematics	Economic Challenges and Students' Learning	Poverty, financial hardship, family responsibilities, limited learning resources	"The child thinks, 'Why should I learn mathematics problem? I need to earn tomorrow.'" (T4)
	Cultural Beliefs about Mathematics	Mathematics anxiety, parental attitudes, fixed ability beliefs, gender stereotypes	"Parents openly tell us, 'Sir, my son is not good at mathematics, just pass him.'" (T1*)*
	Security and Educational Disruptions	School closures, interrupted learning, stress and anxiety	"You cannot expect a child to focus on quadratic equations when they heard explosions." (T9)

Sub-theme 1.1: Economic Hardship and Educational Priorities

Most participants reported that poverty has a significant effect on students' ability in learning mathematics. The participants stated that many students come from low-income families where financial needs have priority above then education. As a result, some students focus more on earning money other than on their studies.

"*Many of our students come from families where the father is bread runner as daily wager laborer or in some cases unemployed. The student thinks, 'Why should I learn mathematics problems? I need to earn for tomorrow.' This mindset is our biggest challenge.*" (T4, Public School)

School leaders also stated that economic pressures often have a greater impact on girls' education. They explained that some families withdraw their daughters from school during times of financial crises or ask them to take on household responsibilities instead of continuing their education.

"*When there is financial stress in any of the family, at first step girls sacrifice their education. We see bright female mathematics students disappear from school because they are needed at home for household or for marriage.*" (L2, Private School)

Participants also explained that many students have limited learning resources at their homes. They mentioned that the lack of resources, a quiet place for study, and support from parents makes it more difficult for students to stay motivated and continue learning mathematics.

Sub-theme 1.2: Cultural Perceptions of Mathematics

Many participants described that cultural beliefs and attitudes effect students' interest and confidence in mathematics learning. They stated that mathematics is often seen as a difficult subject that only highly intelligent students can improve their skills. According to the participants, such beliefs can reduce students' confidence and willingness to face mathematical challenges.

"Parents openly tell us, that their son is not good at math, just pass him.' They have already decided that their child cannot study mathematics. This becomes a self-fulfilling prophecy." (T1, Public School)

Some participants also highlighted that some beliefs affect girls' education. They explained that a few families consider advanced mathematics is unnecessary for girls, which limits their interest

and opportunities to continue learning mathematics subject.

"There is still a belief that girls don't need advanced mathematics. She will get married, why does she need to study calculus?' This thinking limits our girls before they even begin." (T8, Public School)

Sub-theme 1.3: Security and Instability

Few participants highlighted the security related issues and the instability situation of the city that affect students' learning in Quetta. Further, they reported that school closures and interruptions to the academic schedule make it difficult for students to learn mathematics skills, as the subject requires regular practice and continuous learning.

"Strikes, closures, protests these interrupt the rhythm of learning of the students. The subject Mathematics needs continuity. When schools close for a week or more, on returning back to schools the students forget procedures due to they are further behind and more discouraged." (L3, Public School)

Some teachers also perceived that students living in areas affected by instability often experience stress, fear and anxiety, which reduce their concentration and participation in mathematics lessons.

"You cannot expect a child to focus on quadratic equations when they heard explosions the night before. Their minds get divert. Here meaning of resilience is survival first, and mathematics learning at second." (T9, Public School)

Theme 2: Pedagogical Strategies and Teacher Efficacy

This theme explains how teachers understand and use different practices that foster mathematical resilience in students. It highlights that teachers' beliefs, instructional practices, and positive relationships play dynamic role in shaping student resilience.

Table 3: *Pedagogical Strategies and Teacher Efficacy*

Theme	Sub-Theme	Key Codes	Representative Quote
Theme 2: Pedagogical Strategies and Teacher Efficacy	Conceptual Understanding in Mathematics Teaching	Concept-based teaching practices, real-life examples, active learning, reduce rote learning	"If students memorize formulas without understanding them, they collapse when the question changes slightly. But if they understand why the formula works, they can adapt." (T5)
	Encouragement and Emotional Support	Teacher encouragement, positive feedback, motivation, confidence building, recognition	"I motivate my weak students every day: 'You can do it. Yesterday you couldn't, today you can take one step. Tomorrow you will do two.'" (T11)
	Differentiated Instruction and Scaffolding	Peer learning, differentiated instruction, scaffolding, individual support	"The advanced students become peer tutors... while I work with those who need foundational support." (T7)
	Teacher Self-Efficacy and Role Modeling	Teacher confidence, resilience, role model, professional competence	"I got failed in mathematics in my first year of college... I am living proof that you can struggle with mathematics and still master it." (T2)

Sub-theme 2.1: From Rote Learning to Conceptual Understanding

Most of the participants' belief that mathematics instruction is more effective rather than relying on and identified through conceptually teaching as foundational to resilience:

"*If students memorize formulas without understanding them, they collapse when the question changes slightly. But if they understand why the formula works, they can easily adapt those changes. Adapting to the unfamiliar is a resilience*." (T5)

Most of the teacher participants described several teaching strategies that help students in developing conceptual understanding regarding mathematics. These strategies included by using real life examples, visual teaching aids, and connection of new concepts with students' previous knowledge. However, some teachers also explained the class sizes if large then it creates pressure to prepare students for board examinations often limit their ability to use these approaches."

"I want to teach conceptually, but a class with 50 students and board exams pressure, I sometimes have to tell them, this is the formula, now practice these 10 questions.' It pains me, but the education system demands it." (T6, Private School).

Sub-theme 2.2: The Role of Encouragement and Emotional Support

Mostly teachers believed that encouragement and emotional support play an important role in helping students develop academic resilience in mathematics. They explained that motivating students, appreciating their efforts, and giving them confidence encourage them to continue learning even when they face difficulties.

"*I motivate my weak students every day: 'You can do it. Yesterday you couldn't, today you can take one step. Tomorrow you will do two.' Small victories build resilience in students*." (T11, Public School)

Several teachers also explained that they regularly recognize students' progress instead of focusing only on high marks. They believed that appreciating on even small deeds improves student's motivation that keep them trying and strengthens their confidence in mathematics.

"*I placed a chart where I mark every small improvement of every student. When a student sees their name moving up, even by a little, that bring something changes in their eyes. They begin to believe*." (T3, Private School)

Sub-theme 2.3: Differentiation and Scaffolding

The participants explained that students have different learning needs and abilities in the mathematics classroom. They believed that teachers should adapt those teaching methodologies that provide extra support to struggling students while giving more challenging tasks to advanced learners students.

"In my class, I have two type of students those who cannot multiply fractions and students who are ready for calculus. I grouped them strategically. The advanced students become peer tutors, which reinforces their own understanding, while I work with those who need foundational support." (T7, Private School)

However, some participants explained that providing individual support to every students of a class is difficult because of large class sizes and limited resources, especially in public schools.

Sub-theme 2.4: Teacher Self-Efficacy and Resilience Modeling

Many participants believed that teachers' confidence in teaching mathematics plays an important role in developing students' academic resilience. However, the teachers who remain positive and share their own positive learning experiences can encourage students to overcome challenges and continue learning in mathematics.

"I got failed in mathematics in my first year of college. I had to reappear in exams again. When I share this with students, they see that failure is not a big deal. I am living proof that you can struggle with mathematics and still master it." (T10, Public School)

However, some participants realized that a lack of confidence in their own mathematical knowledge

made it difficult to support students effectively. They felt that limited subject knowledge reduced teachers own confidence in answering students' different questions and encouraging them while giving them instruction for their learning process of mathematics.

"I was trained as a general teacher for junior classes, not a mathematics specialist. Sometimes students ask questions I am unable to answer. I feel ashamed of myself, and I know they make sense. How can I teach resilience when I myself feel insecure?" (T10, Public School)

Theme 3: Institutional Support and Leadership Practices

The third theme highlights that how school resources, leadership practices, and institutional support influence the development of academic resilience in mathematics in students. Mostly the participants explained that a supportive school environment, effective leadership, and adequate resources help students to overcome learning challenges, while limited facilities and resources create barriers for learning mathematics concepts.

Table 4: *Institutional Support and Leadership Practices*

Theme	Sub-Theme	Key Codes	Representative Quote
Theme 3: Institutional Support and Leadership Practices	Resource Allocation and Infrastructure	Shortage of mathematics teachers, limited learning resources, inadequate facilities, technology constraints	"We have one mathematics teacher for 200 students. How can it provide individual attention to every student that resilience requires?" (L3)
	Professional Development and Teacher Learning	Teacher training, professional learning, peer collaboration, instructional improvement	"In have 15 years of teaching experience, and only attended two workshops… How am I supposed to learn new methods for teaching of new concepts of mathematics?" (T4)
	Assessment and Accountability Pressures	Examination pressure, teaching to the test, continuous assessment, student performance	"The board exam is a high-stakes gate to for students' future... There is no room for the productive struggle to build resilience." (L6)
	Visionary Leadership and School Culture	Supportive leadership, positive school culture, student motivation, classroom engagement	"We are not here to produce marks. In fact, to produce thinkers." (L2)

Sub-theme 3.1: Resource Allocation and Infrastructure

Most of the participants believed that limited school resources affect students' mathematics learning performance and reduce opportunities to develop academic resilience. They explained that shortages of qualified mathematics teachers,

learning materials, and suitable classroom facilities make it difficult to provide quality education to mathematics students.

"We have one mathematics teacher for 200 students. Not possible to have understanding about each student's struggles, strengths and weaknesses? How can he provide individual attention to every student that resilience requires?" (L3, Public School)

The participants belong from private schools reported that although their schools had relatively better facilities, but they also faced many challenges in using educational technology. They explained that unavailability of internet access and non-functional equipment which limited the effective use of technology in mathematics teaching.

"*We have computers, but not proper internet. We have a smart board that has been broken for six months. Technology could make mathematics visual and engaging, but sustain it difficult task."* (L4, Private School)

Sub-theme 3.2: Professional Development and Teacher Learning

Many participants believed that continuous professional development helps teachers to improve their mathematics teaching skills. However, they have less opportunities for mathematics-specific training, which make it difficult to learn new teaching methods and classroom strategies.

"I have 15 years of teaching experience, and only attended two workshops. Both were based on general pedagogy, not on mathematics subject based. How am I supposed to learn new methods for teaching of new concepts of mathematics?" (T4, Public School)

Some school administrators also explained that they encourage teachers to participate in teachers training programs and share their experiences with other colleagues. They believed that improving teachers' knowledge and skills also improves students' learning and academic resilience.

"I send my mathematics teachers to every available teacher training programs. We also have weekly peer learning meetings where teachers share strategies for the improvement. When teachers grow, students grow." (L2, Private School)

Sub-theme 3.3: Assessment and Accountability Pressures

Participants explained that the examination system have great pressure on teachers and students. They believed that the focus on board examination results encourages memorization rather than understanding, which make it difficult to develop academic resilience in mathematics.

"The board exam is a high-stakes gate for students' future. When the stakes are this high, teachers teach to the test, and students memorize just to pass. There is no room for the productive struggle to build resilience." (L6, Public School)

Some innovative leaders described efforts to prepare students for board examination by using different assessment methods.

"We have introduced continuous class assessments, projects, and presentations. This gives student's multiple ways to learn, not just for exams. Students who fail the test show understanding through projects. This reduces the pressure." (L8, Private School)

Sub-theme 3.4: Visionary Leadership and Culture Building

Effective school administrators described cultivating school cultures that valued effort, improvement, and mathematical thinking over raw achievement.

"I guide teachers and students: We are not here to produce marks. In fact, to produce thinkers. When students are encouraged to learn from their mistakes, they become more confident and resilient." (L2, Private School)

Leaders who actively involved in teaching and learning the can understand students' learning needs and motivate both teachers and students.

"I visit classes every week. Not to inspect, but to learn. I ask students what they are studying, what

they find difficult. When students see that the principal cares about their mathematics learning, they also care." (L1, Public School)

Theme 4: Student Mindset and Community Engagement

This final theme highlights the importance of students' attitudes, beliefs, and community support in developing academic resilience in mathematics. Further students' confidence, family support, peer relationships, and positive encouragement overcome challenges and remain engaged in mathematics learning.

Table 5: *Student Mindset and Community Engagement*

Theme	Sub-Theme	Key Codes	Representative Quote
Theme 4: Student Mindset and Community Engagement	Growth Mindset and Self-Belief	Growth mindset, self-confidence, persistence, positive beliefs, learning from mistakes	"The resilient students share one thing: they believe makes the difference" (T5)
	Peer Relationships and Collaborative Learning	Peer support, collaborative learning, group study, classroom interaction	"When students study mathematics together, they see that others also struggling." (T12)
	Family and Community Support	Parental support, family involvement, community participation, learning environment	"When parents ask their children daily about their learning …When parents little attention, resilience is almost impossible (L5)
	Role Models and Motivated Pathways	Role models, career aspirations, student motivation, future opportunities	"When a former student returns as an engineer or doctor... it transforms what students believe is possible." (T4)

Sub-theme 4.1: Growth Mindset and Self-Belief

Both participants identified students' beliefs about mathematical ability as critical factors of resilience

"The resilient students share one thing: they believe they can improve, even fail, they say, 'I need to try a different way, I am not bad at mathematics.' This belief makes the difference." (T5, Private School)

Participants explained strategies which cultivate growth mindsets, by praising effort, sharing stories of mathematicians who struggled, and normalizing mistakes as learning opportunities.

Sub-theme 4.2: Peer Relationships and Collaborative Learning

Several participants highlighted the role of peer relationships in building resilience,

"*When students study mathematics together, they see that others students also struggling. This is powerful. The student who thinks that he is the only one who doesn't understand then he realizes that struggle as normal. The group study with peers are resilience factors."* (T12, Private School)

However, some participants noted that highly competitive class environment discourage the collaborative resilience practices.

"Our system ranks students publicly. The bottom-ranked students feel humiliated. Instead of supporting each other, students hide their difficulties. Collaboration dies, and resilience may suffer." (T8, Public School)

Sub-theme 4.3: Family and Community Support

Participants' believed family attitudes and support significantly influenced mathematical resilience.

"When parents ask children daily, about their learning, and show genuine interest, students perform better. When parent's little attention, resilience is almost impossible." (L5, Public School)

Participants believed that trusted community organizations could organize educational activities and encourage students to develop a positive attitude toward mathematics.

"*Our mosque has evening study sessions for Quran. Imagine if we had similar community mathematics clubs. If imams encouraged mathematics learning, it motivates students."* (T9, Public School)

Sub-theme 4.4: Role Models and Aspirational Pathways

Participants noted that successful stories of individuals who had succeeded through mathematics provided powerful motivation.

"When a former student returns as an engineer or doctor and tells current students, once I was at your chair, I struggled with these same chapters,' it transforms what students believe is possible." (T4, Public School)

Participants explained that role models are not common in many communities.

"In our community, how many people do students see who succeeded because of mathematics? They see people who succeeded through business, through connections, and some other means. Mathematics does not seem like a pathway to success." (L20, Public School)

Discussion

The findings of the study show that academic resilience in mathematics among secondary school students in Quetta is influenced by individual, teaching, school, and community factors. These findings are consistent with the study's theoretical framework, which views resilience develop through interactions between students and their learning environment rather than an individual characteristic (Ungar, 2017).

The first theme highlighted that socio-economic and cultural challenges, such as poverty, negative beliefs about mathematics, and security related issues, make it difficult for students to develop academic resilience. The findings support Ungar (2017), who stated that resilience is shaped by the interaction through social and environmental conditions in which students live and learn.

The second theme suggested the importance of teachers and classroom practices which build resilience. Participants believed that conceptual teaching, encouragement, differentiated instruction, and teacher confidence help students to overcome learning difficulties. However, they also explained that large class sizes, examination pressure, and limited professional development reduce teachers' ability. These findings are consistent with previous studies which highlight the role of teachers in promoting mathematical resilience (Johnston-Wilder & Lee, 2010; Boaler, 2016).

Third theme showed that school leadership and institutional support play an important role in developing academic resilience. Participants' perceived that supportive leadership, adequate learning resources, and continuous teacher development create a learning environment, while limited resources and examination focused practices restrict resilience. The findings support the work of Leithwood et al. (2004), who emphasized the importance of effective school leadership in improving student learning.

The final theme highlighted the contribution of supportive family, peer relationships, and the wider community. Participants also believed that positive attitudes toward mathematics, supportive families, collaborative learning, and inspiring role models encourage students to remain motivated and persistent in mathematics. These findings also support the socio-ecological perspective, which recognizes that academic resilience develops through the combined influence of schools, families, and the communities (Ungar, 2017).

A Contextually Grounded Framework

Based on the findings of the study proposes the Quetta Mathematics Resilience Framework **(**QMRF**)**, which explains academic resilience in mathematics is influenced by the interaction of four interconnected domains namely individual, pedagogical, institutional, and contextual factors.

Domain	Key Element	Factory that Support Resilience	Factors that Limit Resilience
Individual	Self-belief, persistence, growth mindset, emotional regulation	Teacher encouragement, positive learning experiences, coping strategies	Poverty related stress, anxiety, fixed beliefs for mathematical ability
Pedagogical	Conceptual teaching, differentiated instruction, emotional support, teacher self-efficacy	Subject expertise, professional development, supportive classroom environment	Rote learning, large class sizes, teacher confidence limited
Institutional	School leadership, learning resources, assessment practices, teacher collaboration	Supportive leadership, teacher learning opportunities, flexible assessment	Resources are limited, examination pressure, administrative limitations
Contextual	Family support, peer collaboration, role models, community attitudes, , security	Positive parental involvement, collaborative learning, supportive community	Economic hardship, negative attitudes toward mathematics, security and instability

The framework expressed that resilience is strongest when enabling conditions align across all four domains and weakest when students face multiple challenges at the same time. Importantly, the framework suggests that resilience can be cultivated even in difficult situations through support provided by teachers, schools, families, and the community.

Practical Implications

For Teachers

- Focusing conceptual understanding instead of rote memorization.
- Using real life and locally relevant examples in teaching mathematics.
- Encourage students and recognizing their small achievements.
- Sharing personal learning experiences to motivate students.
- Promoting collaborative learning and peer support.

For School Leaders

- Create school culture that values learning and critical thinking.
- Support teachers through regular classroom visits and productive instructions.
- Provide opportunities for mathematics specific professional training.
- Use different assessment methods instead of examination methods.
- Visits of successful former students to motivate current learners.

For Policymakers

- Hiring of more qualified mathematics teachers in schools.
- Reducing excessive examination pressure to promote conceptual learning.
- Improve school resources and introduce new

learning technology for mathematics education.

- Development of especially mathematics curriculum according to local needs.
- Encourage the community involvement in supporting mathematics education.

Implications for Theory

This study supports the social ecological view of resilience by showing that academic resilience in mathematics is influenced by students, teachers, schools, families, and the community. It also demonstrates that resilience is shaped by the local context, including poverty, cultural beliefs, and security challenges in Quetta. The proposed framework for Quetta (QMRF) highlights that developing academic resilience requires support at multiple levels rather than focusing only on individual students.

Limitations

This study has several limitations. The study was conducted only in Quetta, therefore, the findings cannot be generalized to all over Pakistan, although it may be relevant to similar educational settings. Next, the study included only for mathematics teachers and school administrators, so the findings relate to stakeholders' perceptions rather than students' experiences. Future studies should include students to provide a more comprehensive understanding about academic resilience in mathematics. Further, the study used a cross-sectional qualitative design, which captured participants' views conducted at one point at a time. Future longitudinal studies could explore further about how academic resilience develops and changes over time.

Recommendations

1. Conduct more studies with secondary school students to understand their experiences and perceptions regarding academic resilience in mathematics.
2. A longitudinal study to examine how academic resilience develops over time.
3. Design and evaluate the interventions based on the Quetta Mathematics Resilience Framework (QMRF).
4. Conduct similar studies in other areas of Baluchistan as well as in Pakistan to compare findings across contexts.
5. Use mixed methods research design to combine qualitative findings with quantitative evidence for a more comprehensive understanding about academic resilience in mathematics.

Conclusion

This study explored that how secondary school mathematics teachers and school administrators in Quetta understand and support academic resilience in mathematics. The findings show that academic resilience is influenced by the combined effects of socio-economic conditions, teaching practices, school leadership, and family and community support. According to these findings, the Quetta Mathematics Resilience Framework (QMRF) provides a context specific understanding of the factors that contribute in academic resilience in mathematics.

The study further indicated that academic resilience is not only an individual trait but it develops through supportive relationships and learning environments. Teachers, school administrators, families, and the wider community all have an important role in helping students to overcome the challenges and remain engaged in mathematics learning. Therefore, strengthening academic resilience requires collaborative efforts at the individual, school, and community levels.

Despite facing limited resources and challenging circumstances, the teachers and school administrators' participants demonstrated a strong commitment to supporting students' mathematics learning. Their experiences highlight the importance of encouragement, effective teaching practices, supportive leadership, and positive school culture in promoting academic resilience. Hopefully the findings of this study will contribute for improving mathematics education and support future research and educational practices in Quetta and other similar regions.

Resilience in mathematics is not about being born smart. It is about being surrounded by people who believe you can smart, who give you the tools to try, and who catches when you fall. In Quetta, we are trying to be those people, despite everything.

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