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Exploring mathematics self-efficacy levels among ninth-grade girls: A quantitative study

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Abstract

This study examined the level of mathematics self-efficacy among ninth-grade girls, with particular emphasis on geometry self-efficacy, and explored instructional practices that may enhance their confidence. A quantitative survey design was employed using a validated self-efficacy scale grounded in Bandura's theory, focusing on the geometry unit in the ninth-grade mathematics curriculum. The instrument measured key dimensions of self-efficacy, including magnitude (task difficulty) and generality (transfer of confidence across tasks). The sample consisted of 105 ninth-grade girls selected from four randomly chosen classes in a private school during the first semester of the 2022/2023 academic year. Findings indicated a moderate overall level of mathematics self-efficacy. While participants demonstrated confidence in solving routine mathematical problems, their self-efficacy declined when addressing complex or unfamiliar geometry tasks. The results highlight the need to strengthen sources of self-efficacy, mastery experiences, vicarious experiences, verbal persuasion, and emotional regulation to support female students' engagement in mathematics. Practical implications include implementing differentiated instruction, reinforcement strategies, hands-on geometry activities, and modeling practices. Additionally, curriculum developers and policymakers should integrate structured self-efficacy enhancing strategies within mathematics programs to foster sustained motivation and achievement among female learners.

Keywords: Confidence, Geometry education, Mathematics self-efficacy, Motivation, Ninth-grade girls, Survey study.

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Contents

Contribution of this paper to the literature

This study contributes to the existing literature by examining geometry-specific self-efficacy among ninth-grade girls within a theory-driven framework. The paper's primary contribution is finding that confidence declines with complex geometry tasks despite moderate overall self-efficacy. This study documents targeted instructional practices that can strengthen female students' mathematics self-efficacy and engagement.

1. Introduction

Mathematics, being an essential bridge to scientific advancements, innovation, and problem resolution in most domains, plays a crucial role in ensuring global advancements in science, technology, engineering, and mathematics. Hence, while the need to master mathematics continues to grow on a global scale, it has become extremely important to not only ensure cognitive skill-set development in school youngsters and youth but also to develop self-efficacy in those youngsters, enabling them to be confident about continuing to apply those skills to problem resolution. Teachers/academia are always looking to devise better ways to ensure self-efficacy development, despite the structured nature of mathematics and its inception in early school curricula. However, girls/young ladies continue to suffer from an inability to develop successful self-efficacies despite being an essential skill set, which, in turn, impacts other aspects such as motivation (National Council of Teachers of Mathematics, 1989). Research updates prove an inter-gender gap exists in terms of developing self-efficacies, particularly in unrepresented domains (Skaalvik, Federici, & Klassen, 2015; Star et al., 2014; Trautwein & Möller, 2016).

In early schooling, mathematics is often focused on arithmetic and basic calculations; geometry is usually introduced in middle school as a distinct branch to enhance spatial reasoning and to identify students who are likely to pursue advanced study (Abu Zeina & Ababneh, 2007); Elsayed, Wardat, Alawaed, and Albaraami (2025) and Al-Mufti (2001). Mathematical performance is critically dependent not just on procedural skills but on self-efficacy, beliefs of individuals concerning their capability to execute mathematical tasks successfully. Low efficacy will lead to avoidance, low effort, or early surrender, while high self-efficacy will lead to persistence and challenge-seeking (Ulusoy, 2020; Usher & Pajares, 2006, 2008).

Self-efficacy, defined by Bandura's social cognitive theory, is beliefs about one's capability to organize and execute courses of action required to attain a specific result (Bandura as cited by Elsayed et al. (2025)). These serve as major regulators of thought, emotion, and behavior in learning environments. Multiple definitions converge toward confidence in mobilizing personal resources cognitive, emotional, and social to succeed in the activities under consideration. In mathematics, self-efficacy acts via dimensions of magnitude (motivation to tackle tasks of increasing difficulty), generality (transfer of confidence across related tasks/domains), and strength (resilience against setbacks) (Al-Rayes, Zahran, Huda, & Abdul Aziz, 2012; Elsayed & Abbas, 2021; Schunk, Pintrich, & Meece, 2008). Empirical evidence identifies stronger self-efficacy with better performance, reduced anxiety, and greater achievement, while inversely related to more difficulties in complex tasks such as proofs or spatial reasoning (Baara & Ben Sassi, 2019; Boulton, Hughes, Kent, Smith, & Williams, 2019; Usher & Pajares, 2009; Usher, Weidner, Liem, & McInerney, 2018).

Bandura defines four sources that give rise to these theories: mastery experiences, which refer to students' success and are the most enabling; vicarious experiences, which refer to what others have achieved; verbal persuasion, involving what others tell students; and physiological/emotional, which involves stress or anxiety management. These sources are intertwined, resulting in students' behavioral intentions. These theories are highly relevant to mathematics (Valentine, DuBois, & Cooper, 2004; Wang, Eccles, & Kenny, 2013; Wigfield et al., 1997).

While global research strongly establishes the predictive function of self-efficacy for mathematics learning, significant gaps remain in culturally specific, non-Western contexts, particularly among female secondary students from Arab and Gulf countries. Recent studies from Oman reported mathematics self-efficacy at moderate levels among ninth-grade girls; validated adaptations of self-efficacy scales highlighting the need for contextually relevant tools and deeper investigation of sources and dimensions have included an adaptation of Usher & Pajares' sources scale for Omani middle school students and reported moderate self-efficacy beliefs among ninth-grade females in Oman. In neighboring Saudi Arabia, qualitative inquiry has documented culturally situated influences on sources of self-efficacy among middle school students. At a regional level, more general patterns suggest nuanced gender patterns in STEM self-efficacy, where for girls in some Gulf settings, self-efficacy levels are often high, but persistent challenges about motivation, generalization, and spatial/geometry domains do persist. Few studies have specifically focused on the self-efficacy of ninth-grade girls concerning geometry, a curriculum area that requires strong visualization and problem-solving skills. This might further provoke self-confidence issues at this transitional stage. The overall scarcity limits the number of evidence-based interventions that address cultural and curricular features distinctive to Arab educational contexts (Wolff, Helm, Zimmermann, Nagy, & Möller, 2018; Wu, Guo, Yang, Zhao, & Guo, 2021; Yıldızlı & Saban, 2016).

The present study attempts to bridge these gaps by undertaking a quantitative study on levels of mathematical self-efficacy for ninth-grade girls, specifically regarding motivation, magnitude, and generalization for the geometry unit.

1.1. Research Objectives

The central aim revolves around developing self-efficacy in mathematics, with the specific goal focusing on self-efficacy assessment for ninth-grade girls regarding geometric exercises. Secondary goals involve examining the pattern formed in specific areas, with the ultimate aim of preparing effective suggestions.

1.2. Research Question

What are the levels of mathematics self-efficacy (with emphasis on motivation/magnitude and generalization dimensions) among ninth-grade girls when engaging with geometry tasks?

1.3. Study Scope

This research explores ninth-grade girls and their confidence in dealing with geometry, which is significant in their mathematical learning. It focuses on the geometry unit in the ninth-grade textbook for the first semester of the 2022/2023 school year, as it was the one used during that period. The authors chose geometry because it aligns well with the research topic, involving skills students must use and draw upon. It also assesses how students think, cope with problems, and respond to specific situations.

The research attempts to address these issues through an expert-designed questionnaire on two determinative aspects of confidence: how much the girls are willing to use their skills to solve math problems, and to what degree the girls are confident enough to apply their skills to new, novel, math problem scenarios, i.e., math problem scenarios other than the ones learned, such as applying an understanding of one geometry problem to solving a different geometry problem. This research was conducted, specifically, in the school of Manbaa Al-Hikma, located in the city of Salalah, in Dhofar, during the academic year of 2022/2023, on a sample belonging to the class of ninth-grade girls, consisting of 105 girls. This would allow us to better understand how to help these girls excel in math class.

1.4. Key Terms Defined

1. Self-Efficacy Beliefs in Mathematics: This refers to a ninth-grade student's belief in their ability to succeed in Mathematics. It manifests in their motivation to solve Mathematics problems and how they use past successes to improve performance. It's measured by the score a student receives on the study's questionnaire.
2. Motivation Level (Magnitude): This is how driven a student is when solving Mathematics problems, especially tough ones like proofs, graphs, or equations. It's measured by traits like confidence, ambition, satisfaction, self-assessment, patience, persistence, initiative, and planning.
3. Generalization: This is a student's belief that they can apply success in one Mathematics task to similar tasks. It's measured by how they compare current problems to past ones, apply previous strategies, seek new ways to solve problems, and move from simple to harder tasks.

1.5. Why This Study Matters

This study is significant because it helps elucidate the level of confidence ninth-grade girls have in their mathematics skills. It also highlights what needs to be done for these girls. While examining these confidence levels, it provides school officials and administrators with a comprehensive view of where these students stand. Ninth-grade girls face challenges in mathematics, mainly due to doubts about their abilities. With this knowledge, we can develop strategies to help these students overcome their doubts and excel in mathematics.

These findings will also help a Mathematics teacher to make a positive difference in students' lives. The research indicates how confidence can be measured and also reveals ways in which it can be increased, for instance, by challenging students or praising them. Therefore, through using these approaches, students will feel more confident and will thus perform better in class and develop an increased desire for learning Mathematics. The approach will help ninth-grade students develop positive attitudes, as this is a very important part in their educational journey.

Last, the study promotes improved Mathematics curriculums. This includes activities that promote self-confidence, such as hands-on activities or real-life problem-solving exercises. This can be achieved if Mathematics textbooks are improved to include such activities. This will help students overcome the challenges they face today, which is a Mathematics-driven environment. This study is not just about numbers; it's about empowering young girls to succeed in Mathematics, build self-confidence, and have faith in themselves.

1.6. Conceptual Framework

This study revolves absolutely around knowing the degree of confidence that ninth-grade girls harbor for Mathematics. Essentially, the central concept here revolves around the notion of self-efficacy, which defines it as the beliefs students harbor about their capacity to succeed with Mathematics problems. In other words, according to Bandura's theory of self-efficacy, there are four primary sources of such confidence, whether it is winning in the classroom or seeing someone else succeed with the problem. Other components include hearing someone say "you're awesome!" and a host of other emotional and psychological events. All of this measures the ultimate self-beliefs that students harbor about their capability to succeed with the problems. In other words, how self-assured the students are of the inherent capacity they harbor for Mathematics. During the course of this study, the sources of self-efficacy were explored for ninth-grade girls. Specifically, it revolved around their beliefs about their capacity for Geometry, an integral part of their Mathematics curriculum (Yu et al., 2022).

This is the confidence, or self-efficacy, that has three crucial aspects affecting how students approach Mathematics: motivation level, how driven they are in solving a problem generalization, or using success in one Mathematics topic, say algebra, to tackle another, like geometry and strength, or how unshaken their confidence is by challenges. These facets create differences in performance in Mathematics tasks such as solving equations or constructing proofs. For example, a girl with strong confidence will continue trying even when a geometry problem is difficult, but one with lower confidence will easily give up. Based on these ideas, our research will investigate how confident ninth-grade girls feel about their mathematics, how their classroom environment and teaching methods come into play, and how this confidence leads them toward gaining success in geometry. Once these relationships are noted, intervention techniques may be recommended to enhance their confidence level and help them excel in mathematics (Zakariya, 2022).

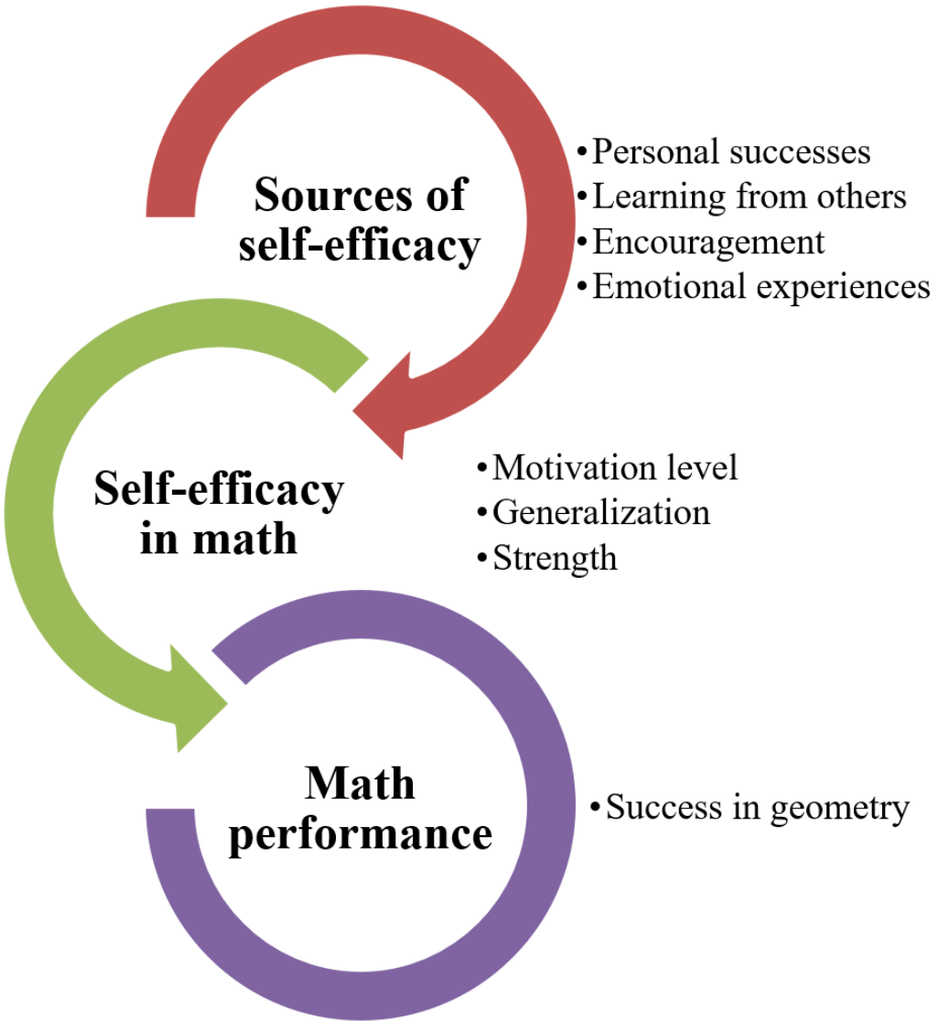

Figure 1. How Self-Efficacy shapes math success.

Figure 1 illustrates the conceptual framework of the study, showing that mathematics self-efficacy develops through four primary sources: mastery experiences (personal successes), vicarious experiences (observing others), verbal persuasion (encouragement), and emotional states. The figure further demonstrates that these sources influence three core dimensions of self-efficacy magnitude (motivation level), generality (transfer across tasks), and strength, which collectively determine students' success in mathematics.

2. Methodology

2.1. Research Design

This quantitative descriptive survey design was employed to explore the self-efficacy levels of ninth-grade girls, with particular emphasis on motivation (magnitude) and generalization, within the curriculum unit of the geometry topic. The design also measured self-efficacy using quantitative data, providing comprehensive and realistic findings about these self-efficacies. Classified as a cross-sectional design, it focused on a single point in time during the first semester of the 2022/2023 academic session, making it suitable for exploring self-efficacies without any specific experimental procedure.

2.2. Participants

Participants included 105 ninth-grade girls selected from four randomly chosen classes at Manbaa Al-Hikma School, a private school located in Salalah, Dhofar Governorate. Random selection minimized bias in class choices, allowing a diverse, representative sample within the school context representing different academic skills and socio-economic backgrounds typical of urban Omani private schools. The sample size was determined based on feasibility and statistical adequacy for descriptive and correlational analyses, sufficient to detect moderate effect sizes at power > 0.80 and $\alpha = 0.05$. The justification for representativeness is based on the demographic similarities of the school with broader Dhofar ninth-grade female populations in private education, with a mix of socio-economic backgrounds and exposure to the national mathematics curriculum. However, this is a single-school sample, best representing urban private school students in southern Oman, which limits broader national or public school inferences.

2.3. Data Collection Tool

A custom-built instrument consisting of a 20-item questionnaire played a central role. Likelihood items pertaining to the specific research query on the concept of mathematics self-efficacy in geometry were followed by the inclusion of a backdrop aligned with Bandura's theory. Specifically, 10 items aimed to capture the component of magnitude. In parallel, 10 items aimed to measure the component of generalization. Importantly, a Likert scale consisting of 5 levels (=Never; 5='Always') provided a richer form of quantification. Content validity followed a review conducted by experts; specifically, the research instrument underwent a thorough review by six experts in the field of mathematics education within the Faculty of Dhofar University. Furthermore, item-total correlations

using Pearson's r test for discrimination purposes confirmed that all items should be retained: the results ranged between 0.42 and 0.78; >0.30. Refer to Table 1 for applicable information.

2.4. Data Analysis Technique

The analysis was conducted using SPSS version 22, employing descriptive statistics such as means, standard deviations, and percentages to summarize self-efficacy level results. Pearson correlations served as inferential statistics to examine relationships between dimensions and overall scores. From a quantitative perspective, the instrument proved valuable for objectively identifying patterns, including self-efficacy averages within each category and the correlations among dimensions. This design differs from previous studies by focusing on adapting a survey specifically for the Omani context. Most global research utilizes general self-efficacy scales, such as the Mathematics Self-Efficacy Scale, whereas regional studies in Oman and Saudi Arabia often incorporate qualitative elements or broader constructs. Our approach emphasizes measuring dimensions related to geometry, thereby increasing precision beyond simple descriptive surveys in the Arabic context. For example, a Jordanian correlational study by Baara and Ben Sassi (2019) lacked a geometrical focus. Additionally, this design addresses the gap in culturally adapted tools by adding quantitative rigor to deepen insights, contrasting with Saudi qualitative explorations of sources, and aiming for more generalizable findings.

2.5. External Validity and Generalizability

External validity was also increased due to the alignment of the questionnaire with the national curriculum for the ninth-grade geography course and the assessment of the questionnaire's suitability across cultures. However, the external validity of this study can only be generalized to urban ninth-grade girls attending private schools within the region of Dhofar due to the single-site selection of the study and the potential for urban versus rural school cultures to differ. However, the findings can cautiously be generalized to other Gulf regions with the same curriculum and dynamics between genders and cannot be accurately generalized to coeducation or public school settings, boys, or other school subjects.

The main tool used for this research was a questionnaire, which was constructed “from scratch” for our big question: “How confident are these girls in math?” The questions were scored on a 5-point scale: “Always,” “Often,” “Sometimes,” “Rarely,” and “Never,” covering items like “Do you feel good about solving math problems?” or “Can you explain your answers to others?” To make our questionnaire “on point,” we also shared our results with six math education specialists based at Dhofar University. We also wanted to assess our results for consistency. You do that by examining how consistent each question was compared to our results. We used statistical analysis to do that, ‘Pearson’s correlation.’ The chart below assesses how consistent each question was:

Table 1. How well the questionnaire questions align.

Item #	Question	Correlation Score	Significance
1	I’m confident I’m good at solving math problems compared to others.	0.665	0.000
2	I compete with my classmates to solve math problems faster.	0.588	0.000
3	I can solve math problems using what I’ve learned before.	0.503	0.000
4	I find it hard to turn geometry data into graphs.	0.227	0.020
5	I move to another problem if I get stuck on one.	0.500	0.000
6	I can use math theories I’ve learned to solve new problems.	0.591	0.000
7	I feel confident while solving math problems.	0.601	0.000
8	After solving a math problem successfully, I try similar ones to confirm my understanding.	0.660	0.000
9	One of my goals is to use math in my future career.	0.554	0.000
10	I have the skills to explain math problems to my classmates.	0.462	0.000
11	I work hard on math problems to prove my abilities to my classmates.	0.588	0.000
12	I choose challenging math problems to discover new things.	0.558	0.000
13	I do my best on math homework to achieve my goals.	0.630	0.000
14	I can explain my answers to math problems to my teacher or classmates.	0.486	0.000
15	I think math is an easy subject.	0.557	0.000
16	I prefer new and different math problems to improve my skills.	0.713	0.000
17	If I encounter a challenging math problem, I begin working on it immediately.	0.615	0.000
18	I feel proud when I compete with classmates in solving math problems.	0.734	0.000
19	I don’t give up on a math problem, no matter how long it takes.	0.661	0.000
20	I feel satisfied after solving a math problem.	0.515	0.000

To ensure the questionnaire was delivering reliable data, the reliability was tested using the method known as Cronbach’s Alpha. The score was impressive, at 0.941, which means the questionnaire was very consistent. While Table 2 depicts the reliability of the questions, which ranged between 0.875 and 0.890, it was already confirmed that the questions were delivering dependable results that can be trusted for the interpretation aimed at understanding the confidence in the girls.

Table 2. How reliable are the questionnaire questions?

Item #	Question	Cronbach's Alpha	Reliability
1	I'm confident I'm good at solving math problems compared to others.	0.880	0.938
2	I compete with my classmates to solve math problems faster.	0.879	0.937
3	I can solve math problems using what I've learned before.	0.890	0.943
4	I find it hard to turn geometry data into graphs.	0.883	0.939
5	I move to another problem if I get stuck on one.	0.879	0.937
6	I can use math theories I've learned to solve new problems.	0.877	0.936
7	I feel confident while solving math problems.	0.882	0.939
8	After solving a math problem successfully, I try similar ones to confirm my understanding.	0.885	0.941
9	One of my goals is to use math in my future career.	0.879	0.937
10	I have the skills to explain math problems to my classmates.	0.880	0.938
11	I work hard on math problems to prove my abilities to my classmates.	0.878	0.937
12	I choose challenging math problems to discover new things.	0.883	0.939
13	I do my best on math homework to achieve my goals.	0.881	0.938
14	I can explain my answers to math problems to my teacher or classmates.	0.875	0.935
15	I think math is an easy subject.	0.875	0.935
16	I prefer new and different math problems to improve my skills.	0.879	0.937
17	If I face a tough math problem, I start working on it right away.	0.877	0.936
18	I feel proud when I compete with classmates in solving math problems.	0.875	0.935
19	I don't give up on a math problem, no matter how long it takes.	0.877	0.936
20	I feel satisfied after solving a math problem.	0.882	0.939
Overall Questionnaire		**0.886**	**0.941**

Note: Reliability is the positive square root of Cronbach's Alpha. The high scores (0.941 overall, 0.875–0.890 for individual items) show the questionnaire is very reliable and perfect for this study's goals.

In order to analyze these, to make sense of the obtained data, there exists software that can help do so; it is known as SPSS version 22. There are different things that need to be considered, such as the percentage, the average, and the answers that were most repeated, as well as other parameters like the Standard Deviation, which shows the level of variability. There is also Pearson's correlation to determine the quality of the obtained answers, as well as Cronbach's Alpha. In order to determine the confidence levels of the girls, the categories will be as follows in Table 3.

Table 3. Confidence levels by average score.

Confidence Level	Average Score Range
Very Weak	Less than 0.8
Weak	0.8 to less than 1.6
Moderate	1.6 to less than 2.4
High	2.4 to less than 3.2

This clear and thorough approach ensured we got a true picture of how confident these girls feel about math, setting the stage for practical insights to help them succeed.

3. Results

In Table 4, it can be seen how ninth-grade girls answered in response to a questionnaire about how much confidence they have in Mathematics, including average, standard deviation, confidence level, and ranks with regard to each question.

The current research surveyed 105 ninth-grade girls from Manbaa Al-Hikma School in Salalah. The participants were asked about their confidence in mathematics knowledge through a survey of 20 questions. The results, shown in Table 4, indicate the confidence level for each question: high confidence, scored around 2.4 to 3.2, or medium confidence, scored around 1.6 to less than 2.4. A range indicating high confidence first, followed by medium. The level of variation was also shown.

Table 4. Confidence in mathematics among ninth-grade girls.

Item #	Question	Average Score	Variation (Std. Dev.)	Confidence Level	Rank
5	I move to another problem if I get stuck on one.	3.000	1.130	High	1
20	I feel satisfied after solving a Mathematics problem.	2.838	1.279	High	2
13	I work hard on my mathematics homework to reach my goals.	2.676	1.355	High	3
18	I feel proud when competing with classmates in Mathematics.	2.666	1.190	High	4
1	I'm confident I'm good at solving Mathematics problems compared to others.	2.657	1.239	High	5
8	After solving a Mathematics problem, I try similar ones to check my understanding.	2.657	1.378	High	6
14	I can explain my Mathematics answers to my teacher or classmates.	2.628	1.374	High	7
3	I can solve Mathematics problems using what I've learned before.	2.571	1.150	High	8
16	I prefer new Mathematics problems that help me improve my skills.	2.561	1.270	High	9
19	I don't give up on Mathematics problems, no matter how long	2.533	1.279	High	10

Item #	Question	Average Score	Variation (Std. Dev.)	Confidence Level	Rank
	they take.				
17	I start working on tough Mathematics problems right away.	2.504	1.177	High	11
7	I feel confident while solving Mathematics problems.	2.485	1.309	High	12
2	I compete with classmates to solve Mathematics problems faster.	2.371	1.272	Moderate	13
6	I can use Mathematics theories to solve new problems.	2.333	1.245	Moderate	14
15	I think Mathematics is an easy subject.	2.304	1.345	Moderate	15
11	I work hard on mathematics problems to prove my abilities to my classmates.	2.295	1.358	Moderate	16
12	I choose challenging Mathematics problems to discover new things.	2.295	1.329	Moderate	17
10	I can explain Mathematics problems to my classmates.	2.266	1.520	Moderate	18
4	I find it hard to turn geometry data into graphs.	2.152	1.215	Moderate	19
9	I want to use Mathematics in my future career.	1.904	1.614	Moderate	20

The results from the study conducted on 105 ninth-grade girls at Manbaa Al-Hikma School indicate varying confidence levels in mathematics, with the minimum confidence at 1.904 and the maximum at 3.000. This reflects the diverse confidence among the girls regarding their skills in mathematics, where some are quite proficient at solving problems, while others feel less confident about their abilities in the subject.

A good number, representing a solid 60%, or 12 out of 20, indicates high confidence levels since all these scores are above 2.4. The girls are clear winners regarding sticking or persevering on math problems and feeling good about these efforts. For instance, they scored best (3.000) on sticking or persevering on a mathematics problem. As mentioned earlier, this means they are able to rise above challenges by trying another problem if they get stuck because they know how to switch and look for a new problem. The girls also feel good about competing against others and accomplishing a problem, which means they enjoy mathematics and working hard.

On the flip side, only 40%, which is the same as 8 out of 20, scored moderately as their trust levels ranged between 1.6 and 2.4. These girls are still unsure about whether to apply new theories in Mathematics to solve questions, whether they think Mathematics is an easy subject, etc. However, the lowest score, which was 1.904, was from the girls wanting to apply the concepts studied in Mathematics to their future professions. Perhaps the reason for the low score is that the girls have not been shown the excitement within the foreseeable world where Mathematics will come into use, perhaps due to their difficulty in understanding some concepts, for instance, geometry.

Overall, these findings depict ninth-grade girls who possess motivation and perseverance but struggle to feel confident. The high confidence level in persevering through difficulties in math is a positive starting point; however, scores related to answering career aspirations or applying concepts suggest room for improvement. Teachers and schools have an opportunity to make math relevant to everyday life and create a safe environment where ninth-grade girls can build confidence in themselves.

4. Discussion

Within the study, the results point to moderate self-efficacy in ninth-grade girls' mathematics, similar to some recent literature within the context. For example, a study published in 2025 focusing on ninth-grade girls from an Omani context found moderate self-efficacy in mathematics for the sample, similar to the study at hand: "The Gulf states are a region of great social and cultural significance within the Middle Eastern context…. In the context of the study at hand, fair self-efficacy was found for ninth-grade female students in the context of the above-discussed aspects within the mathematics context. For example, a similar study published in 2025 found fair self-efficacy for ninth-grade girls from an Omani context."

The study sample showed moderate self-efficacy regarding magnitude and self-efficacy in the context of geometry problems, and being able to solve a problem, and if not, being able to solve it by rephrasing it until he is satisfied with the answer (M=3.0). Relatively speaking to peers, the rapidity of the subjects experiencing the answer, of which there was pride, is most likely the cause of the peer-related geometry problem. Bandura's self-efficacy was similar to this. There is effort and persistence toward the answer. However, less confidence was noted in the generalization dimensions, e.g., the ability to apply mathematics theories to new problems (the item related to career, as low as 1.904). Regarding the specificity of 'geometry,' the difficulty in visualization and graphing (item 4, mean=2.152) exemplifies the sample's difficulty in transferring skills. This aligns with evidence related to the geometry confidence gap. This gap persists even if overall performance was comparable, as seen with declining confidence among girls and overall performance in geometry (studies on self-efficacy, geometry, and spatial anxiety, 2022–2024). It indicates that motivation remains, but it is not part of a highly developed longitudinal system. This gap can significantly impact motivation to engage in the STEM trajectory.

Factors of a classroom and instruction itself may also affect things like low verbal persuasion and low mastery opportunities, which are correlated with low persistence and supportive sources below the framework of Bandura and the most recent Omani validations of the adjusted self-efficacy scales supportive of the cultures and contexts (e.g., the adaptation of the Usher and Pajares sources scale to Omani middle schools, 2023-2024). In regional studies, without sufficient hands-on supports, abstraction and visualization postponement rely on planning. Most studies suggest a low relevance score on career relevance, which also underscores failure to teach the mathematics of real-world engineering and data science applications, a perennial obstacle in Arab contexts where girls have a high interest in STEM fields like medicine but low confidence in broader applications, as evidenced by a study in Saudi Arabia on STEM self-efficacy and career preferences among girls, 2024.

These outcomes validate predictions of self-efficacy, performance and persistence correlation (Boulton et al., 2019). High beliefs predict effective task performance, but low confidence creates stagnation in areas of proofs and equations, which handles complex problems. Most recent international meta-analyses (2022-2025) reveal small to

moderate STEM/math self-efficacy and confidence gaps, with boys overrepresented in various underrepresented fields, while girls often report less confidence despite received the same or even better grades (enduring STEM gender gap meta-analysis, 2025; PISA 2022 motivation profiles report boys overrepresented in the extremes of high motivated and unmotivated).

Although research from around the world and the Arab world suggests that girls generally possess less self-efficacy (i.e., more anxiety surrounding math and less confidence in spatial tasks), in some contexts of the Gulf, female students even show strong self-efficacy in STEM fields, particularly in medicine, which may be related to cultural focus on some professions and/or more rewarding contexts (Saudi qualitative exploration of sources among middle schoolers, 2025; high self-efficacy in Riyadh female students, 2024). The variations show that context may be an important factor (i.e., type of school, curriculum) and the moderating/geometric demands on context specific reflects the school's focus).

The limitations of this study are the geography restricted to one school (which limits generalizations to areas beyond urban Omani private schools), the focus on one area of mathematics (confidence may be affected in other areas such as algebra), and the use of self-assessment (which could be subject to bias). Future studies could use a multisite approach and add boys to provide direct comparisons between the sexes, as well as focus on source interventions that depend on vicarious models and experiential hands-on activities in the area of geometry.

The moderate self-efficacy that exists implies that there are positive possibilities for improvement. By creating positive learning environments, using experiential materials, and connecting mathematics to various professions, teachers can improve students' motivation, their transfer of mathematical skills to problems outside of the classroom, and their confidence for the future, particularly girls who are in critical transition periods.

5. Conclusion

This study highlights a moderate level of self-efficacy in mathematics among ninth-grade girls at Manbaa Al-Hikma School in Salalah, based on responses from 105 participants. A significant finding shows a high level of strength in the dimension related to magnitude, particularly in persistence and problem-switching when stuck, with 60 percent of items indicating high confidence. However, there is a notable weakness in generalization, such as applying mathematical concepts to new problem situations and perceiving mathematics as relevant to future careers, with 40 percent of items rated at moderate or lower levels. These patterns suggest solid motivation but also reveal a lack of confidence and perceived usefulness in spatial and geometry areas.

The results, in a theoretical perspective, reinforce Bandura's social cognitive theory by illustrating self-efficacy beliefs in a given context i.e., the Arab world, specifically Omani culture, whereby moderate levels of female secondary students will most likely be due to lack of mastery experiences, verbal persuasion and vicarious modeling in the geometry teaching and learning process.

This study contributes to the emerging literature on the gender nuances of self-efficacy. While most global and Arabic literature reports girls' persistent lack of confidence in mathematics and STEM fields, new Omani studies involving the validation of the Self-efficacy Sources Scales (such as adapted Usher and Pajares (2009)), and findings depicting most ninth-grade females as moderate believers (Elsayed et al., 2025) highlight the need to construct contextually relevant models that address regional strengths (such as high STEM interest in the supported Gulf) and existing challenges (like the visualization barriers in geometry). The study enhances the understanding of the effect of self-efficacy on the transitional phases of schooling and the mathematics education gender equity target.

5.1. Limitations

There are several constraints that outline the findings. The samples drawn were from one private urban school located in Dhofar, and therefore, the findings cannot be applied to the broader Omani public/rural or Gulf population, which may vary in terms of socio-economic, curricular, or culture-related factors. The fact that the respondents relied on self-report through the Likert-scale questionnaire raises the possibility of social desirability or recall bias, although the risks were lessened through expertise validation and item correlation. The geometry-specific focus may not fully address self-efficacy across all mathematical topics (e.g., algebra), and the cross-sectional design does not allow for tracking changes over time or drawing causal inferences. Lastly, the absence of boys or mixed-gender comparisons provides scant insight into patterns that may be attributed to the distinct genders.

5.2. Directions for Future Research

The future should focus on multisite methodologies in Omani public and private schools to improve representativeness and identify regional differences. A longitudinal study on self-efficacy developmental trajectories and the impact of interventions would have the greatest impact. Including comparative studies with boys would help address gaps in intergroup variance. Additionally, using qualitative methodologies such as vicarious and emotional state experiences would bridge gaps in quantitative data. Impact studies involving specific assistive strategies like hands-on geometers, peer modeling, and real-world career relevance would contribute to the literature on improving students' general career relevance. A greater focus on the 2023 Omani adapted scales would enhance literature in the Arab context.

To summarize the 9th graders as showcasing mathematical self-efficacy and emotional resilience mental constructs, the posit the need of intervention of the constructs self-efficacy the mental construct of positive emotional resilience. Therefore, structural, strategic, and self-efficacy responsive interventions need to occur. The literature as it's currently constituted would suggest the need for activity-based and emotionally safe interventions. Addressing these gaps will enhance the extent of mathematics and related fields girls' ambitions, and improve the equity of educational and career opportunities.

5.3. Recommendations and Suggestions

To help boost students' confidence in Mathematics, the study suggests.

1. Teacher Training: Offer workshops to train Mathematics teachers on ways to build students' confidence, improving their performance across all school levels.
2. Update Teacher Education: Add strategies and activities to college Mathematics education courses to help future teachers encourage student confidence.
3. Enhance Mathematics Textbooks: Include more activities in elementary and middle school Mathematics books to build students' belief in their abilities.
4. Test New Teaching Methods: Conduct studies to try modern teaching strategies that boost confidence in Mathematics for students at different school levels.
5. Explore Related Factors: Do more studies to compare students' Mathematics confidence with skills like doing proofs or critical thinking.

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