

**Self-confidence in studying mathematics and its relationship to
mathematical anxiety among students at the Preparatory Studies Center,
Sultan Qaboos University, Sultanate of Oman**

الثقة بالنفس في دراسة الرياضيات وعلاقتها بالقلق الرياضي لدى طلبة مركز الدراسات التحضيرية، جامعة
السلطان قابوس، سلطنة عمان

Salim bin Said Al-Wahaibi

Educational Researcher, Ministry of Education, Sultanate of Oman

ss.alwahaibi.75@gmail.com

Salim bin Saeed Al-Hudaify

Lecturer, Centre for Preparatory Studies, Sultan Qaboos University, Sultanate of Oman

salimsaid@squ.edu.om

Mohammed Al-Natour

Lecturer, Centre for Preparatory Studies, Sultan Qaboos University, Sultanate of Oman

alnatour@squ.edu.om

Received: 07 / 01 / 2026

Accepted: 18 / 06 / 2026

Abstract:

The current research sought to analyze self-confidence in studying mathematics among students at the Preparatory Studies Center at Sultan Qaboos University. Self-confidence in mathematics was analyzed and differences in it were investigated according to some variables. The research relied on the descriptive analytical approach, where a scale of self-confidence in mathematics was applied by Fennema and Sherman (1976), which was later developed in the study of Garro and Solano, and Castro and Ramírez (2023; Garro-Camacho & Solano-García, 2020). The research sample consisted of (33) male and female students. The results showed that the majority of the sample members were concentrated in the medium (57.6%) and high (36.4%) levels of self-confidence in mathematics. The results also showed that males tend to have a higher and more stable level of confidence compared to females, and

that students who repeated the course three times showed a relatively higher level of confidence than others. In addition, there was a difference in averages between colleges. This variance was not statistically significant at the significance level ($\alpha = 0.05$).

Keywords: Self-confidence in studying mathematics; Self-confidence scale; Preparatory Studies Center; Students.

ملخص:

هدفت هذه الدراسة إلى تحليل الثقة بالنفس في دراسة الرياضيات لدى طلاب مركز الدراسات التحضيرية بجامعة السلطان قابوس. وتم تحليل هذه الثقة ودراسة الفروقات فيها وفقًا لبعض المتغيرات. واعتمدت الدراسة على المنهج الوصفي التحليلي، حيث طُبِّق مقياس الثقة بالنفس في الرياضيات الذي وضعه فينيم وشيرمان (1976)، والذي طُوِّر لاحقًا في دراسات جارو وسولانو، وكاسترو وراميريز (2023؛ جارو-كاماتشو وسولانو-غارسيا، 2020). وتكونت عينة البحث من 33 طالبًا وطالبة. وأظهرت النتائج أن غالبية أفراد العينة كانوا ضمن المستويين المتوسط (57.6%) والعالي (36.4%) من الثقة بالنفس في الرياضيات. كما أظهرت النتائج أن الذكور يميلون إلى امتلاك مستوى أعلى وأكثر استقرارًا من الثقة مقارنةً بالإناث، وأن الطلاب الذين أعادوا دراسة المقرر ثلاث مرات أظهروا مستوى أعلى نسبيًا من الثقة مقارنةً بغيرهم. بالإضافة إلى ذلك، كان هناك اختلاف في المتوسطات بين الكليات. لم يكن هذا التباين ذا دلالة إحصائية عند مستوى الدلالة ($\alpha = 0.05$).

الكلمات المفتاحية: الثقة بالنفس في دراسة الرياضيات؛ مقياس الثقة بالنفس؛ مركز الدراسات التحضيرية؛

الطلاب.

1. Introduction

Many universities around the world strive to offer preparatory or foundation programs for various academic courses, including mathematics, with the aim of equipping students with the essential foundations of mathematics before commencing their undergraduate studies. In this context, Sultan Qaboos University in the Sultanate of Oman established the Center for Preparatory Studies in 2016, which offers a foundation program designed in accordance with the standards of the Oman Authority for Academic Accreditation and Quality Assurance. This program includes a set of academic courses, among them mathematics, and aims to strengthen students' fundamental knowledge of mathematical and analytical techniques—essential tools for developing

problem-solving skills—and to foster the study skills necessary for effective learning and sustainable academic growth (Sultan Qaboos University, 2025).

This focus on mathematics education stems from research findings indicating that success in learning mathematics within such programs is a strong predictor of engagement and achievement in subsequent university studies. Moreover, research has shown that the affective domain has a significant influence on mathematics learning, which has inspired further investigations into the emotional factors associated with mathematics learning and their interrelationships (Báez & Meza, 2020; Cerda et al., 2016).

The affective domain encompasses emotions, attitudes, and beliefs that characterize cognitive processes, influencing and guiding them. This domain plays a crucial role in teaching and learning, prompting researchers and educators to give it increasing attention due to its direct impact on academic performance (Castro & Ramírez, 2023; Báez & Meza, 2020; Garro-Camacho & Solano-García, 2020).

Among the affective domain variables that have received considerable attention in mathematics education research over the past decade is self-confidence in mathematics. Studies have examined its concept, development, and relationship with other variables such as academic performance, gender, and choice of study track (Castro & Ramírez, 2023; Garro-Camacho & Solano-García, 2020; Pérez-Teteca et al., 2013; Pérez-Teteca, 2012).

Several instruments have been developed to measure the variable of self-confidence in mathematics, including the Fennema and Sherman Mathematics Attitudes Scales (Fennema & Sherman, 1976), which consist of nine dimensions, one of which is “Confidence in Learning Mathematics.” This scale has been adapted and validated across various educational contexts. Another example is the Del Rey, Madera, and Ortega-Ruiz Scale (Del Rey, Madera & Ortega-Ruiz, 2011), which measures positive attitudes such as self-confidence and resilience.

Theoretical Framework

2.1 Self-Confidence in Mathematics

Self-confidence is understood as a belief, which MacLeod (1992) classified among an individual's beliefs about themselves as a mathematics learner. It refers to a student's confidence in their ability to learn mathematics and perform mathematical tasks effectively and is associated with their willingness to exert the necessary effort to complete assigned tasks (Garro-Camacho & Solano-García, 2020; Pérez-Teteca, 2012; Pérez-Teteca et al., 2013).

Fennema and Sherman (1976) indicated that mathematical self-confidence is directly linked to an individual's belief in their ability to comprehend and correctly apply mathematics-related teaching and learning processes. Students with high levels of self-confidence tend to develop a positive self-perception and are motivated to learn more, either with the teacher's assistance or independently. They are also more willing to study and solve additional mathematical problems, distinguishing them from students who lack confidence in their ability to deal with mathematics (Castro & Ramírez, 2023; Garro-Camacho & Solano-García, 2020; Pérez-Teteca, 2012).

Garro and Solano (2020) summarized several definitions of self-confidence in mathematics as proposed by different researchers. Pierce, Stacey, and Barkatsas (2007) defined it as students' perception of their ability to achieve good results and their confidence in overcoming difficulties in mathematics. Pérez-Teteca (2012) defined it as an individual's belief in their mathematical competence, reflected in the student's confidence in handling mathematics-related tasks. Similarly, Pérez-Teteca et al. (2013) defined it as an individual's confidence in themselves as a mathematics learner.

According to Meza et al. (2019), due to variations in how researchers have defined mathematical self-confidence in the educational literature, several have adopted Pérez-Teteca's (2012) definition, which integrates the perspectives of Fennema and Sherman (1976) and MacLeod (1992). This definition views self-confidence in mathematics as an individual's **belief in their mathematical competence**, encompassing confidence in their ability to handle mathematics-related tasks (Castro & Ramírez, 2023; Báez & Meza, 2020; Garro-Camacho & Solano-García, 2020; Meza et al., 2019). This study also adopts this definition.

2.2 The Impact of Self-Confidence in Mathematics

Garro and Solano (2020) reported that many studies have found statistically significant gender differences in mathematical self-confidence, with females generally exhibiting lower levels than males, who tend to have higher levels of self-confidence.

Báez and Meza (2020) also indicated that research shows gender-based differences in mathematics proficiency, concluding that females usually display lower self-confidence in mathematics compared to males. Similarly, Agüero, Calderón, Meza, and Suárez (2016) conducted a study on a sample of 2,984 students from schools under the Ministry of Education in 2015. Their results indicated that 78.9% of students demonstrated medium to high levels of self-confidence, with statistically significant differences between males and females in favor of males.

At the same time, several researchers, including Castro and Ramírez, Báez and Meza, and Garro and Solano (Castro & Ramírez, 2023; Báez & Meza, 2020; Garro-Camacho & Solano-García, 2020), confirmed that studies consistently report gender-based differences, even in cases where females have no reason to feel less confident, as their academic performance is not inferior to that of males. In contrast, Winta and López (2017), as cited in Garro and Solano (2020), found no significant gender differences in mathematical self-confidence.

Brown and Joseph (2001), cited in Meza et al. (2019) and Garro and Solano (2020), found differences in mathematics self-confidence between males and females, attributing these differences to societal stereotypes, such as the belief that males are “good at mathematics” while females are “weak,” or to factors that lead females to enroll in fewer mathematics courses or discourage them from studying mathematics to the same extent as males. Meza et al. (2019) added that some researchers argue that these gender differences are unfounded, as females’ academic performance is not inferior.

Regarding the impact of self-confidence in mathematics on academic performance or choice of specialization, research indicates that it plays a significant role in enhancing students’ achievement. Pérez-Teteca (2012), as cited in Garro and Solano (2020) and Báez and Meza (2020), noted that various studies found a positive relationship between self-confidence and academic performance: the more confident a student is in their mathematical abilities, the better their performance, and vice versa. However, Pérez-Teteca (2012) emphasized the difficulty of establishing a clear causal relationship between mathematical self-confidence and academic achievement.

Báez and Meza (2020) reported that some studies concluded that the level of self-confidence in mathematics may influence students' choice of future academic specialization. Cerda et al. (2016) confirmed that higher confidence in learning mathematics is strongly associated with academic success in the field.

Finally, Arrieta (2016), as cited in Báez and Meza (2020) and Meza et al. (2019), concluded that academic performance and self-confidence in mathematics are positively correlated, supporting the argument that achieving good performance in mathematics requires—though may not solely depend on—a positive self-concept and belief in one's competence in completing mathematical tasks.

In light of the above, the present study aims to analyze self-confidence in mathematics among students at the Center for Preparatory Studies at Sultan Qaboos University. The goal is to verify the consistency of previous research findings with this student population, thereby contributing to the enhancement of teaching and learning by providing a more comprehensive understanding of the characteristics of the students in the sample, and supporting the ongoing research efforts of Sultan Qaboos University, represented by the Center for Preparatory Studies, in this field.

3. Research Questions

Based on the above, this study seeks to answer the following questions:

1. What is the level of self-confidence in mathematics among students of the Center for Preparatory Studies at Sultan Qaboos University?
2. Are there any differences in self-confidence in mathematics among students of the Center for Preparatory Studies at Sultan Qaboos University attributed to gender?
3. Are there any differences in self-confidence in mathematics among students of the Center for Preparatory Studies at Sultan Qaboos University attributed to the college to which they belong?
4. Are there any differences in self-confidence in mathematics among students of the Center for Preparatory Studies at Sultan Qaboos University attributed to the number of times they have repeated the mathematics course?

4. Research Hypotheses

- **H1:** There are no statistically significant differences at the level ($\alpha = 0.05$) in self-confidence in mathematics among students of the Center for Preparatory Studies at Sultan Qaboos University attributed to gender.
- **H2:** There are no statistically significant differences at the level ($\alpha = 0.05$) in self-confidence in mathematics among students of the Center for Preparatory Studies at Sultan Qaboos University attributed to the college to which they belong.
- **H3:** There are no statistically significant differences at the level ($\alpha = 0.05$) in self-confidence in mathematics among students of the Center for Preparatory Studies at Sultan Qaboos University attributed to the number of times they have repeated the mathematics course.

5. Research Objectives

The study aims to:

- Measure the overall level of self-confidence in mathematics among students.
- Determine whether there are differences in students' self-confidence in mathematics according to gender.
- Determine whether there are differences in students' self-confidence in mathematics according to the college to which they belong.
- Determine whether there are differences in students' self-confidence in mathematics according to the number of times they have repeated the mathematics course.
- Identify the academic disciplines in which students demonstrate a higher level of self-confidence in mathematics.

6. Significance of the Study

Theoretical Significance: This study contributes to enriching the educational literature related to the concept of self-confidence in mathematics among university students, which still lacks sufficient quantitative studies. Moreover, it is one of the few studies that has adapted the Fennema and Sherman (1976) model, which was later utilized by Garro-Camacho and Solano-García (2020). In this research, the model was translated, developed, and adapted to align with the Omani context and the environment of the Center for Preparatory Studies at Sultan Qaboos University.

Practical Significance: The study helps diagnose students' self-confidence in mathematics at the university level, thereby contributing to data-driven decision-making and providing quantitative results that can be used to develop academic and psychological support strategies within the Center for Preparatory Studies. The researchers hope that this study will serve as a foundation for future research in this field. Additionally, the "Mathematics Self-Confidence Scale" can be used as a periodic assessment tool to determine students' confidence levels in mathematics, guiding early intervention programs and identifying the factors that influence students' confidence in learning mathematics.

7. Research Terms

7.1 Self-Confidence in Mathematics:

Refers to the belief in one's mathematical self-efficacy, consisting of a person's confidence in their ability to handle mathematics-related tasks.

Operational Definition: The score obtained by a student through the administration of the adapted and validated Mathematics Self-Confidence Scale.

7.2 Students:

Refers to students enrolled in the mathematics course during the specified period at the Center for Preparatory Studies, Sultan Qaboos University.

Operational Definition: Students registered at the Center for Preparatory Studies at Sultan Qaboos University during Summer 2025.

7.3 Center for Preparatory Studies:

An academic unit at Sultan Qaboos University that prepares new students through a foundation program including English, Mathematics, Information Technology, and Academic Study Skills to ensure their readiness for successful university studies.

8. Research Delimitations

The scope of this study is limited to students of the Center for Preparatory Studies at Sultan Qaboos University during Summer 2025 of the 2024/2025 academic year.

9. Research Population

The research population consists of all students enrolled in the Center for Preparatory Studies at Sultan Qaboos University during the 2024/2025 academic year.

10. Research Sample

The sample includes all students registered in the Center for Preparatory Studies at Sultan Qaboos University during Summer 2025 of the 2024/2025 academic year.

11. Research Methodology

The descriptive method was adopted to achieve the objectives of the study, which aimed to identify the level of self-confidence in mathematics among students at the Center for Preparatory Studies at Sultan Qaboos University and to examine the presence of differences according to selected variables.

The study is descriptive in nature as it investigates the characteristics and traits of the students. Additionally, a correlational analysis was conducted to explore differences in mathematical self-confidence based on the research variables.

12. Research Instrument

After reviewing the educational literature on self-confidence assessment, the researchers employed the Mathematics Self-Confidence Scale developed by Fennema and Sherman (1976) and later refined by Garro-Camacho and Solano-García (2020) to collect data. This instrument is a Likert-type scale consisting of twelve items, whose validity has been confirmed for over forty years. It aligns closely with the conceptual definitions of mathematical self-confidence presented in the literature (Garro-Camacho & Solano-García, 2020). The researchers translated and adapted the scale to suit the research environment.

12.1 Content Validity

The scale was presented to a panel of experts to ensure the linguistic clarity and appropriateness of the items, allowing for modifications, deletions, or additions as deemed necessary. The final version retained all twelve items, identical to the original scale, aiming to measure students' levels of self-confidence in mathematics and to examine whether statistically significant differences exist in mathematical self-confidence based on certain demographic variables.

Responses were coded on a five-point Likert scale ranging from 1 to 5, where 5 represents "Strongly Agree" and 1 represents "Strongly Disagree." Some items were reverse-coded because they were phrased in the opposite direction of other items, ensuring that higher scores consistently indicate higher levels of self-confidence in mathematics.

Students' self-confidence scores were categorized into five levels—Very Low, Low, Moderate, High, and Very High—according to the classification applied by Pérez-Teteca (2012) as cited in Castro and Ramírez (2023), as shown in Table 1.

Table 1. Levels of Self-Confidence in Mathematics

Class	Class Width	Level
From 12 to < 21.6	9.6	Very Low
From 21.7 to < 31.2	9.5	Low
From 31.3 to < 40.8	9.5	Moderate
From 40.9 to < 50.4	9.5	High
From 50.5 to < 60	9.5	Very High

12.2 Statistical Processing

To answer research questions 1, 2, 3, and 4, arithmetic means and standard deviations of students' scores on the Mathematics Self-Confidence Scale were calculated. The level of the scale was determined according to a scoring criterion developed for this purpose, in order to identify the degree of self-confidence in mathematics. The same procedure was applied to each demographic variable, including gender, field of study, and the number of repetitions of the course.

To test research hypotheses 1, 2, and 3, normality tests and homogeneity of variance tests were conducted, followed by one-way analysis of variance

(One-Way ANOVA) and t-tests to verify the statistical significance of differences across the variables.

13. Discussion of the Results

13.1 Discussion of the First Question

To answer this question, the overall arithmetic mean of the scale was calculated, as shown in Table 2 below:

Table 2 The Mean and Standard Deviation of the Mathematics Self-Confidence Scale
Descriptive Statistics

	Number	Minimum	Maximum	Mean	Std. Deviation
Self-Confidence Scale	33	26.00	48.00	38.4545	4.75717
Valid Number (listwise)	33				

Table 2 shows that students' scores on the Mathematics Self-Confidence Scale ranged from a minimum of 26.00 to a maximum of 48.00. The overall mean score was 38.45, indicating that students' level of self-confidence in mathematics tends to be high compared to the minimum possible score. The standard deviation (4.76) reflects a moderate variation among students' scores around the mean, suggesting that most students cluster around similar levels of self-confidence, with limited individual differences. The statistical significance of these differences will be examined during hypothesis testing.

Furthermore, students' scores were categorized according to the classification in Table 2 as reported by Castro & Ramírez (2023), and the percentages of students at each level of self-confidence, along with their frequencies, were calculated, as shown in Table 3.

Table 3 Percentages of Students' Levels of Mathematics Self-Confidence

Level	Frequency	Percent	Valid Percent	Cumulative Percent
Low	2	6.1	6.1	6.1
Moderate	19	57.6	57.6	63.6
High	12	36.4	36.4	100.0
Total	33	100.0	100.0	

Table 3 indicates that the majority of students at the Preparatory Studies Center have moderate to high levels of self-confidence in mathematics, while there are almost no students at the extreme levels (very low or very high). Among them, 12 students (36.4%) have a high level of self-confidence, representing approximately one-third of the sample, and 19 students (57.6%) exhibit a moderate level, corresponding to nearly two-thirds of the sample. Only two students (6.1%) had a low level of self-confidence, reflecting a clear concentration around moderate to positive levels.

13.2 Discussion of the Second Question

To answer this question, the arithmetic means and standard deviations of the self-confidence scale were calculated according to gender, as shown in Table 4:

Table 4 Means and Standard Deviations of the Self-Confidence Scale by Gender

Gender		Males	Females
Number		27	6
Mean		38.81	36.83
Std. Deviation		4.40	6.34
95% Confidence Interval	Lower Limit	37.07	30.18
	Upper Limit	40.55	43.48

The descriptive statistics in Table 4 indicate that male students ($n = 27$) had a mean score of 38.81 with a standard deviation of 4.40, whereas female students ($n = 6$) had a lower mean of 36.83 and a higher standard deviation of 6.34. This reflects greater variability among female students compared to males. The 95% confidence interval shows that males' mean ranges between 37.07 and 40.55, while females' mean ranges between 30.18 and 43.48. This suggests that males tend to have higher and more stable self-confidence levels, whereas female scores fluctuate within a wider range, despite a lower overall mean.

13.3 Discussion of the Third Question

To answer the third question, the means and standard deviations were calculated according to the students' colleges. Results are presented in Table 5:

Table 5 Means and Standard Deviations of the Self-Confidence Scale by College

College		Agriculture	Arts	Economics	Education	Engineering	Law	Science
Number		6	10	7	1	2	5	2
Mean		38.5	39.4	39.0	36.0	35.5	37.6	38.0
Std. Dev.		4.8477	4.5753	4.4721	0	0.7071	8.0187	1.4142
95% CI	Lower Limit	33.4127	36.127	34.864	0	29.1469	27.6434	25.2938
	Upper Limit	43.5873	42.673	43.136	0	41.8531	47.5566	50.7062

The results indicate variability in students' self-confidence across colleges. The highest mean appeared in the College of Arts (39.4, SD = 4.58), followed by Economics (39.0, SD = 4.47), and Agriculture (38.5, SD = 4.85). The College of Science had a mean of 38.0 (SD = 1.41), while the College of Law had a mean of 37.6 with the largest variability (SD = 8.02). The College of Education had a mean of 36.0 with no standard deviation due to a single student, whereas Engineering showed the lowest mean (35.5, SD = 0.71).

The 95% confidence intervals indicate relatively narrow ranges for Arts and Economics, and wider ranges for colleges with higher variability, such as Law. Overall, the results suggest that students' confidence levels cluster around 38 across most colleges, with lower averages in Engineering and Education. Statistical tests will determine the significance of these differences.

13.4 Discussion of the Fourth Question

To answer the fourth question, means and standard deviations were calculated according to the number of times students repeated the mathematics course. Results are shown in Table 6:

Table 6 Means and Standard Deviations by Number of Course Repetitions

Number of Repetitions	Once	Twice	Three Times	First attempt
Number	11	1	3	18
Mean	37.1818	38	43.3333	38.4444
Std. Dev.	5.19265	0	2.51661	4.55324

95% CI	Lower Limit	33.6933	0	37.0817	36.1802
	Upper Limit	40.6703	0	49.5849	40.7087

Table 6 shows that students who repeated the course three times had the highest mean score (43.33, SD = 2.52), with a 95% confidence interval of 37.08–49.58, indicating a noticeably high self-confidence level. Students who repeated the course once had a lower mean (37.18, SD = 5.19) with a wider confidence interval (33.69–40.67). First-time students had a mean of 38.44 (SD = 4.55), reflecting moderate to high confidence, while the single student who repeated twice scored 38.00 with no variability. These results suggest that repeated exposure to the course may enhance students' confidence, but excessive repetition does not necessarily increase it further.

13.5 Discussion of the First Hypothesis

Null Hypothesis (H_0):

There is no statistically significant difference at the level of ($\alpha = 0.05$) in mathematics self-confidence among the Preparatory Studies Center students at Sultan Qaboos University (Summer 2025) according to gender.

Alternative Hypothesis (H_a):

There is a statistically significant difference at the level of ($\alpha = 0.05$) in mathematics self-confidence among the Preparatory Studies Center students at Sultan Qaboos University (Summer 2025) according to gender.

Since the null hypothesis involves two groups based on gender (male/female), an independent samples T-Test was used to compare the means

between them. To correctly apply this test, two assumptions must be verified: normality of the data and homogeneity of variances.

First: Checking the Normality of the Data

Given that the sample size in this study is less than 50, the central limit theorem cannot be applied (which assumes normality if the sample size is greater than 100). Therefore, normality was tested using the Shapiro–Wilk Test or the Kolmogorov–Smirnov Test, as shown in Table 7.

Table 7 Normality Test for the Self-Confidence Scale

	Kolmogorov–Smirnov ^a			Shapiro–Wilk		
Gender	Statistic	df	Sig.	Statistic	df	Sig.
Male	0.129	27	0.200*	0.965	27	0.467
Female	0.191	6	0.200*	0.911	6	0.446

*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

As shown in Table 7, the significance values for the Kolmogorov–Smirnov test (Sig = 0.200) and Shapiro–Wilk test (Sig = 0.467 for males, Sig = 0.446 for females) are all greater than the significance level ($\alpha = 0.05$). Therefore, the data for both males and females follow a normal distribution. This allows the use of **parametric tests** for hypothesis testing.

Second: Testing the Homogeneity of Variances

After confirming normality, **Levene’s Test** was conducted to verify the homogeneity of variances between groups. Results are shown in Table 8.

Table 8 Levene’s Test for Homogeneity of Variances

	df	Sig.
Self-Confidence Scale	1.099	0.303

Table 8 shows that the significance value (Sig = 0.303) is greater than $\alpha = 0.05$, indicating that the assumption of homogeneity of variances is met. Therefore, the independent samples T-Test can be applied assuming equal variances, as presented in Table 9.

Table 9 Independent Samples T-Test for the Self-Confidence Scale

		t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
							Lower	Upper
Self-Confidence Scale	Equal variances assumed	0.921	31	0.364	1.98148	2.15221	-2.40798	6.37094

As shown in Table 9, the T-Test value ($t = 0.921$) with degrees of freedom ($df = 31$) has a significance level ($Sig = 0.364$) greater than $\alpha = 0.05$. This indicates that there is **no statistically significant difference** in mean mathematics self-confidence scores between male and female students at the Preparatory Studies Center, Sultan Qaboos University (Summer 2025).

Accordingly, the **null hypothesis (H_0)** is accepted, confirming that:

"There is no statistically significant difference at the level $\alpha = 0.05$ in mathematics self-confidence among students at the Preparatory Studies Center at Sultan Qaboos University based on gender."

6.13 Discussion of the Second Hypothesis

Null Hypothesis (H_0):

There is no statistically significant difference at the level ($\alpha = 0.05$) in mathematics self-confidence among the preparatory studies center students at Sultan Qaboos University (Fall 2025) according to the college they belong to.

Alternative Hypothesis (H_a):

There is a statistically significant difference at the level ($\alpha = 0.05$) in mathematics self-confidence among the preparatory studies center students at Sultan Qaboos University (Fall 2025) according to the college they belong to.

Since this hypothesis involves more than two groups (as it includes students from seven colleges), a One-Way Analysis of Variance (ANOVA) was used to test the hypothesis. Before conducting ANOVA, the necessary assumptions—normal distribution of the data and homogeneity of variances—were verified.

First: Checking the Normal Distribution of the Data

Given that the sample size for each college was less than 50, the **Shapiro–Wilk test** and **Kolmogorov–Smirnov test** were conducted to assess normality. The results are shown in Table 10.

Table 10 Normality Tests for the Self-Confidence Scale by College

College	Kolmogorov–Smirnov Statistic	df	Sig.	Shapiro–Wilk Statistic	df	Sig.
College of Agriculture and Marine Sciences	0.374	6	0.009	0.734	6	0.014
College of Arts and Social Sciences	0.237	10	0.119	0.908	10	0.264
College of Economics and Political Science	0.160	7	0.200*	0.973	7	0.921
College of Engineering	0.260	2				
College of Law	0.264	5	0.200*	0.930	5	0.596
College of Science	0.260	2				

* This is a lower bound of the true significance.

a. Lilliefors Significance Correction

c. Confidence_scale is constant when the college it is in = Education. It has been removed.

Most colleges exhibited normal distributions, as indicated by significance values greater than $\alpha = 0.05$ in the Colleges of Arts and Social Sciences (sig. = 0.119; 0.264), Economics and Political Science (sig. = 0.200; 0.921), and Law (sig. = 0.200; 0.596) in both tests.

The normality assumption was not satisfied for the College of Agriculture and Marine Sciences (sig. = 0.009; 0.014), and normality could not be verified for the Colleges of Engineering and Science due to the very small sample sizes ($n = 2$). The College of Education was excluded from the analysis because the self-confidence values were constant. Overall, parametric tests can be applied since normality was achieved in the majority of colleges.

Second: Testing the Homogeneity of Variances

After assuming normal distribution, **Levene's Test** was conducted to check homogeneity of variances. The results are presented in Table 11.

Table 11 Levene's Test for Homogeneity of Variances

Test	Levene Statistic	df1	df2	Sig.
Based on Mean	2.046	5	26	0.105
Based on Median	0.824	5	26	0.544
Based on Median with adjusted df	0.824	5	17.210	0.550
Based on Trimmed Mean	1.914	5	26	0.126

All methods show significance values greater than $\alpha = 0.05$, indicating that the assumption of homogeneity of variances is met. Therefore, One-Way ANOVA is appropriate for analyzing differences in mathematics self-confidence across colleges.

Results of One-Way ANOVA

Table 12 ANOVA for Mathematics Self-Confidence According to College

Source	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	38.582	6	6.430	0.244	0.957
Within Groups	685.600	26	26.369		
Total	724.182	32			

The ANOVA results indicate that there are no statistically significant differences in mathematics self-confidence among students based on their college affiliation ($F = 0.244$, $df = 6, 26$, $\text{Sig.} = 0.957$), which is much greater than $\alpha = 0.05$. Therefore, the null hypothesis (H_0) is accepted, and the alternative hypothesis (H_a) is rejected. This indicates that mathematics self-confidence does not differ significantly across colleges at the Preparatory Studies Center, Sultan Qaboos University.

7.13 Discussion of the Third Hypothesis

Null Hypothesis (H_0):

There are no statistically significant differences at the level ($\alpha = 0.05$) in mathematics self-confidence among students of the Preparatory Studies Center at Sultan Qaboos University that can be attributed to the number of times the mathematics course has been repeated.

Alternative Hypothesis (H_a):

There are statistically significant differences at the level ($\alpha = 0.05$) in mathematics self-confidence among students of the Preparatory Studies Center at Sultan Qaboos University that can be attributed to the number of times the mathematics course has been repeated.

Since this hypothesis involves comparing more than two groups (four categories based on the number of course repetitions), a One-Way Analysis of Variance (ANOVA) was applied as the appropriate statistical method. Prior to performing ANOVA, it was necessary to verify the underlying assumptions, namely the normality of data distribution and the homogeneity of variances among groups.

First: Verification of Normal Data Distribution

Given that the sample size in each group is less than 50, the Shapiro–Wilk and Kolmogorov–Smirnov tests were used to verify normality. The results are presented in Table (13) below:

Table (13) Verification of the Normal Distribution of Data

Number of Course Repetitions	Kolmogorov–Smirnov Statistic	df	Sig.	Shapiro–Wilk Statistic	df	Sig.
Once	0.179	11	0.200*	0.953	11	0.677
Three times	0.219	3	—	0.987	3	0.780
First-time enrollment	0.109	18	0.200*	0.974	18	0.868

* This is a lower bound of the true significance.

a. Lilliefors Significance Correction

c. The confidence scale is constant when the number of repetitions = 2; this group was removed from the analysis.

As shown in Table (13), all groups for which analysis was possible satisfied the normality assumption, with significance values exceeding $\alpha = 0.05$.

This indicates that the mathematics self-confidence data are normally distributed across the relevant categories, permitting the use of parametric statistical tests.

Second: Testing the Homogeneity of Variances

To determine whether differences among groups were statistically significant, Levene's Test was conducted to assess the homogeneity of variances. The results are shown in Table (14):

Table (14) Results of Levene's Test for Homogeneity of Variances

Variable		Levene Statistic	df1	df2	Sig.
Self-Confidence Scale	Based on Mean	0.630	2	29	.540
	Based on Median	0.641	2	29	.534
	Based on Median and adjusted df	0.641	2	25.425	.535
	Based on Trimmed Mean	0.627	2	29	.541

Table (14) shows that all calculations of Levene's Test for the self-confidence scale yielded significance values greater than $\alpha = 0.05$, indicating that the homogeneity of variances assumption is satisfied. Consequently, the One-Way ANOVA test could be validly applied.

One-Way ANOVA Results

The results of the ANOVA test for mathematics self-confidence according to the number of course repetitions are presented in Table (15):

Table (15) Results of One-Way ANOVA for Mathematics Self-Confidence by Number of Course Repetitions

Source of Variation	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	89.434	3	29.811	1.362	0.274
Within Groups	634.747	29	21.888		
Total	724.182	32			

Table (15) indicates that the differences in mean mathematics self-confidence scores according to the number of course repetitions were not statistically significant. The ANOVA test yielded $F = 1.362$ with $df = 3, 29$ and $Sig. = 0.274$, which is greater than $\alpha = 0.05$.

Therefore, the null hypothesis (H_0) is accepted, indicating that there are no statistically significant differences in mathematics self-confidence among

students of the Preparatory Studies Center at Sultan Qaboos University according to the number of times they have repeated the mathematics course.

14. Discussion of Results

The descriptive statistics showed that the majority of students at the Preparatory Studies Center in the research sample had moderate levels of mathematics self-confidence (57.6%) and high levels (36.4%). These findings partially align with Castro & Ramírez (2023), who reported that approximately 36.01% of students exhibited low to moderate levels of mathematics self-confidence. They are also consistent with Meza et al. (2019), where around 79% of students demonstrated moderate to high levels of mathematics self-confidence. In contrast, the findings differ from Garro-Camacho & Solano-García (2020), who indicated that 87.1% of students showed low levels of mathematics self-confidence.

The descriptive statistics also indicated that male students tend to have higher and more stable levels of mathematics self-confidence compared to female students. However, the results of the current study showed no statistically significant differences at the level $\alpha = 0.05$ in mathematics self-confidence based on gender among students at the Preparatory Studies Center (Summer 2025) at Sultan Qaboos University. This finding is descriptively consistent with several previous studies, including Agüero, Calderón, Meza & Suárez (2016), Meza et al. (2019), Báez & Meza (2020), and Castro & Ramírez (2023), which reported similar trends. Statistically, the present study confirms that these differences are not significant. The results also align with Winta & López (2017) as cited in Garro-Camacho & Solano-García (2020), and with Meza et al. (2019), while differing from Garro-Camacho & Solano-García (2020), who reported significant gender-based differences in favor of female students.

The results revealed variability in mathematics self-confidence according to the college to which the students belong. Descriptively, this is consistent with Castro & Ramírez (2023), who reported differences in mathematics self-confidence based on the field of study or college affiliation. However, statistically, the current study found **no significant differences** in mathematics self-confidence according to college affiliation.

Descriptive statistics further indicated that students who repeated the mathematics course three times exhibited higher levels of mathematics self-confidence compared to other groups. While traditional theory might predict a decrease in confidence with repeated failure, this could be attributed to the

positive effects of repeated enrollment on some students' self-confidence, especially when coupled with accumulated experience, enhanced self-learning skills, and intrinsic motivation. Prior exposure to failure may also better prepare students for examinations and academic challenges, thereby reducing anxiety and increasing confidence compared to students who repeated the course only once and lacked sufficient experience to develop coping skills.

Nevertheless, the results of the current study confirmed no statistically significant differences at the level $\alpha = 0.05$ in mathematics self-confidence according to the number of times the mathematics course was repeated. This indicates that, in this context, self-confidence is not affected by the frequency of course repetition. To the best of the researchers' knowledge, this aspect has not been explored in previous studies, making the current research a pioneering contribution to the literature in this area.

15. Conclusion

In light of the above research findings, it can be confirmed that the level of self-confidence in mathematics among students at the Center for Preparatory Studies at Sultan Qaboos University during Summer 2025 is generally moderate to high, with the majority of students concentrated in the moderate and high levels. The results also indicated that male students tend to exhibit higher and more stable levels of self-confidence compared to female students. Students who repeated the mathematics course three times demonstrated higher levels of self-confidence than other groups. Additionally, there were differences in the mean self-confidence scores across colleges. However, all these differences were not statistically significant at the level $\alpha = 0.05$, reflecting a relative consistency in self-confidence levels across gender, college affiliation, and the number of course repetitions.

These results emphasize the importance of leveraging the moderate and high levels of self-confidence observed in most students to develop instructional and training strategies aimed at enhancing both psychological and academic outcomes. Special attention should be given to students with low levels of self-confidence to provide support and empower them to better face academic challenges in mathematics.

16. Recommendations

Based on the current research findings and to enhance students' self-confidence, the researchers propose the following recommendations:

1. Strengthen psychological and academic support programs for university students, particularly those with low self-confidence, through regular individual and group counseling sessions.
2. Integrate interactive teaching strategies into mathematics courses (such as visual representations, cooperative learning, and problem-based learning), as they contribute to raising self-confidence and promoting active participation.
3. Provide additional training opportunities for students who face repeated challenges in the course, focusing on building self-confidence through activities that accommodate individual differences and offer graduated support.
4. Raise faculty awareness of the psychological-academic dimension of learning mathematics through training workshops that introduce strategies to enhance students' self-confidence.
5. Conduct future studies on mathematics self-confidence using larger and more diverse samples from different academic levels to test the generalizability of the current findings.
6. Include self-confidence indicators as part of the educational assessment in preparatory courses to simultaneously monitor students' academic and psychological development.
7. Leverage the experiences of students with high self-confidence through peer mentoring programs, allowing them to transfer positive experiences to their less confident peers.

17. References

- Agüero, E., Calderón, M., Meza, G. & Suárez, Z (2016). Relación entre autoestima y autoconfianza matemática en estudiantes de educación media costarricense. *Revista Comunicación*. Año 37, volumen 25, número 2, julio – diciembre, 2016. Instituto Tecnológico de Costa Rica. ISSN: 0379-3974 / e-ISSN1659-3820.
- Agüero-Calvo, E., Calderón-Ferrey, M., Meza-Cascante, L. G., & Suárez-Valdés-Ayala, Z. (2016). Relación entre autoestima y autoconfianza matemática en estudiantes de educación media costarricense. *Revista Comunicación*, 25(37, 2), 4–13. Instituto Tecnológico de Costa Rica. <https://doi.org/10.18845/rc.v25i2-16.3302>

- Arrieta, M. (2016). Relación entre el rendimiento académico y el nivel de “autoconfianza matemática” y de “ansiedad matemática” en estudiantes del curso MA1103 Matemática Básica para Administración del Instituto Tecnológico de Costa Rica (Tesis de licenciatura inédita). Instituto Tecnológico de Costa Rica, Cartago.
- Báez, N. & Meza, G. (2020). Un estudio de la ansiedad matemática, la autoconfianza matemática y la actitud hacia utilidad de la matemática en estudiantes de carreras administrativas en una universidad privada de Costa Rica. Revista Académica Institucional RAI. Sección Academia, Edición 3, pp. 33-56.
- Brown, R. P. y Josephs, R. A. (2001). El peso de la prueba: Diferencias de género y relevancia de los estereotipos en el desempeño matemático. *Nómadas*, 14, 110-123. Recuperado de <http://www.redalyc.org/pdf/1051/105115268010.pdf>
- Calderón, P. y Guillén, C. (2016). Estudio sobre “autoconfianza matemática” y su relación con la “ansiedad matemática” en dos de los colegios técnicos de la provincia de Cartago (Tesis de licenciatura inédita). Instituto Tecnológico de Costa Rica.
- Castro, A, & Ramírez, M., (2023). Estudio de la relación entre la ansiedad matemática y la autoconfianza matemática en estudiantes de los cursos de matemática de la Sede Metropolitana de la Universidad Latinoamericana de Ciencia y Tecnología en el III Cuatrimestre de 2022, ResearchGate, USA. <https://www.researchgate.net/publication/368750908>
- Cerda, C., Ortega, R., Casas, J., Del Rey, R. y Pérez, C. (2016). Predisposición desfavorable hacia el aprendizaje de las Matemáticas: una propuesta para su medición. En: *Estudios Pedagógicos XLII*, No. 1: 53-63.
- Del Rey, R., Madera, E. & Ortega-Ruiz, R. (2011). Validation of CAT-Ma: an instrument of measure of the emotional impact of mathematics learning. Proceedings of the 14th Biennial conference of the European association for Research on learning and instruction, Exeter/United Kingdom.
- Fennema, E., & Sherman, J. (1976). Fennema-Sherman mathematics attitudes scales: Instruments designed to measure attitudes towards the

learning of mathematics by females and males. *Journal for Research in Mathematics Education*, 7, 324-326.

- Garro-Camacho, K. E., & Solano-García, M. L. (2020). Estudio de la relación entre las variables “predisposición desfavorable hacia el aprendizaje de la matemática” y “autoconfianza matemática” en estudiantes de secundaria del Colegio Miravalle (Tesis de licenciatura, Instituto Tecnológico de Costa Rica). Escuela de Matemática. <https://hdl.handle.net/2238/12298>
- MacLeod, D. (1992). Research on affect in mathematics education: A reconceptualization. En D.A. Grows (Ed), *Handbook of Research on Mathematics Teaching and Learning* (pp. 575-596). New York: Macmillan Publishing Company.
- Meza-Cascante, L. G., Agüero-Calvo, E., & Suárez-Valdés-Ayala, Z. (2019). La autoconfianza matemática de estudiantes de educación secundaria: Un estudio en Costa Rica. *Revista Electrónica Educare*, 23(1), 1–15. <https://doi.org/10.15359/ree.23-1.3>
- Muñoz, J. & Mato, M.D. (2008). Análisis de las actitudes respecto a las Matemáticas en alumnos de ESO. *Revista de Investigación Educativa*, 26 (1), 209-226
- Pérez-Tyteca, P. (2012). La ansiedad matemática como centro de un modelo causal predictivo de la elección de carreras. (Tesis doctoral) Universidad de Granada.
- Pérez-Tyteca, P., Monje, J. y Castro, E. (2013). Afecto y matemáticas. Diseño de una entrevista para acceder a los sentimientos de alumnos adolescentes. *Avances de Investigación en Educación Matemática*, 4, 65-82.

- Pierce, R., Stacey, K., & Barkatsas, A. N. (2007). A scale for monitoring students' attitudes to learning mathematics with technology. *Computers and Education*, 48(2), 285-300
- Ramos, N. (2015). Estudio de la relación entre "Ansiedad Matemática" y "Autoconfianza Matemática" en tres colegios privados costarricenses. (Tesis de licenciatura inédita) Instituto Tecnológico de Costa Rica.
- Sánchez, J. y Jiménez, A. (2016). Estudio de la relación entre las variables de autoconfianza matemática y autoestima en estudiantes de la Sede Interuniversitaria de Alajuela (UCR UNA - ITCR). (Tesis de licenciatura inédita) Instituto Tecnológico de Costa Rica.
- Tapia, M. y Marsh, G. E. (2004). An instrument to measure mathematics attitudes. *Academic Exchange Quartely*, 8(2).
- Wynta, R. & López, V. (2017). Estudio de los niveles de “ansiedad matemática” y “autoconfianza matemática” que manifiestan los estudiantes de la Universidad de Costa Rica, Sede del Caribe (Tesis de licenciatura). Instituto Tecnológico de Costa Rica.