Journal of Positive Psychology & Wellbeing
2022, Vol. 6, No. 3, 275-290
http://journalppw.com
ISSN 2587-0130

A Comparison between the Closed Classroom Environment and the Open Classroom Environment in Teaching Mathematics to Female University Students

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Abstract

This study aimed to identify the (closed classroom environment, CCE) and the (open classroom environment, OCE) in teaching mathematics to female university students through the validity and reliability implications used by the female students. The study sample included (31) female students, divided into (17) female students in (OCE), and (14) female students in (CCE) in the Kingdom of Saudi Arabia. A purposive sample was chosen, and a mathematics scale was applied to detect the effect of the closed and (OCE) on mathematical operations, which include (Differentiation and Integration, algebra, probability and statistics, and geometric shapes). For Differentiation and Integration (-0.144), teaching algebra (-0.033), teaching statistics (0.094), and teaching geometric shapes (-0.105), the values are not statistically significant at the significance level (0.05).

The results showed that the reliability of the split-half method on (CCE) was (Part1 = 0.951), and on (OCE) it was (Part2 = 0.919), meaning that the split-half method was (0.978). And the Cronbach's alpha reliability coefficient was (0.959).

The results showed that there are no statistically significant differences at the significance level (0.05) between (CCE) and (OCE) for Differentiation and Integration. There are differences in algebra in favor of (CCE), there are differences in statistics and probability in (OCE), and there are differences in geometric shapes in (OCE).

The results showed that there are no statistically significant differences at the significance level (0.05) between (CCE) and (OCE) due to the teacher type variable.

The study recommends conducting more studies and research related to (OCE) and (CCE) and their impact on mathematics.

Keywords*: Classroom environment, closed environment, open environment, mathematics.*

Introduction

One tradition of Saudi society when it comes to teaching female university students is to place a barrier in the way of the male teacher and the female student so that the female student can see the blackboard and the male teacher, but the male teacher cannot see the female students because it is common for Saudi women to conceal their faces from men.

It is of enormous global interest because we have not acclimated people to it. We will contrast this with an (OCE) with a female teacher. As a result, a review of the literature connected to rising concerns concerning Saudi

women's experiences, particularly how men engage with them in the academic setting, such as teaching mathematics, which is regarded as an essential topic for them, was conducted. As a result, this study addresses the study's background and reason, which investigates how universities have contributed to shaping the social and cultural pattern of Saudi women's experience inside academia in mathematics instruction.

The current study will cover a classroom experiment that contrasts two university-level teaching methods: (CCE) and (OCE).

Research Problem

The process of teaching mathematics is thought to have a unique nature in the teaching process, particularly through the interaction between the teacher and the students, but with the presence of (CCE), this will pose a challenge compared to (OCE), and thus the study's problem was formulated in the following main question:

- What is the comparison between the closed classroom environment and the open classroom environment in teaching mathematics to female university students?

The following sub-questions arise from the research problem, which deals with the psychometric properties:

1- What are the implications of the validity of the comparison between the closed classroom environment and the open classroom environment in teaching mathematics to female university students?

2- What are the implications of the Reliability of the comparison between the closed classroom environment and the open classroom environment in teaching mathematics to female university students?

3- Are there statistically significant differences at the significance level (0.05) between the closed classroom environment and the open classroom environment in teaching mathematics to female university students?

4- Are there statistically significant differences between the closed classroom environment and the open classroom environment in teaching mathematics to female university students due to the variable type of teacher?

Research Importance

First: The theoretical importance of this research lies in:

- Stirring interest in the classroom environment among students.
- Clarifying the relationship between the closed and open classroom environment in the teaching process.

Second: The practical importance:

- Identify the concept of closed and open classroom environments.
- Enriching the field of mathematics teaching by providing an understanding of teaching methods.
- Identify the characteristics and attributes of the closed and open classroom environment.
- Helping researchers benefit from the results in dealing and communicating with students inside restricted environments.
- Benefiting from the results in making appropriate decisions in preparing the classroom environment.

Research Goals

Verifying teaching methods in (CCE) and (OCE) for mathematics by arriving at educational standards for that category.

Research Justification

- The scarcity of Arab studies that dealt with research on (CCE) and (OCE) environments in Saudi universities.
- The lack of Arab studies that focused on (CCE) and (OCE) environments in teaching mathematics to female students.

Research Limitations:

Research limits include the following:

- Age limits: The application of this study was limited to female university students in the age group (18-20) years.
- Spatial limits: The application of this study was limited to the Kingdom of Saudi Arabia (eastern region - Al-Ahsa).
- Temporal limits: Data collection for this study occurred during the 2022 academic year.

Research Delimitations

The results are determined by the limited sample to be studied, and the researcher was not able, through his research, to access and identify other cases in the Kingdom of Saudi Arabia.

Definitions of Terms

1- The classroom environment: It is the location of education and provides space for carrying out an activity at a specific time. As a result, some material and pedagogical circumstances in the classroom setting were required. It outlines the administration's and the school's vision, mission, and values.

2- Mathematics: A body of abstract knowledge resulting from logical deductions applied to various mathematical objects, such as sets, numbers, shapes, structures, and transformations. Mathematics is also concerned with the study of topics such as quantity, structure, space, and change. There is not yet an agreed-upon general definition of the term.

3- The open classroom environment: The "open" classroom includes many open activities, through the participation of new people, materials, ideas, and values in the classroom environment. A climate of openness is necessary for the development of student independence. Exploration, knowledge, experience, and tolerance characterize it. Students also need to change their beliefs while expanding their understanding and perspective.

4- The closed classroom environment: These are the broadcast rooms in academic higher education between female students and a female teacher teaching them. This room comprises a glass barrier so that the female students can see the university professor and the university professor cannot watch them. The reason is a reflective glass barrier. The lighting is dim on the students' side, so they can talk without the teacher seeing the students.

Theoretical framework and Previous studies

Saudi culture is such a complex mixture of traditional and Islamic values that it is difficult to distinguish between the social and the religious. showed (Gallagher, Searle, 1985) that someone deliberately built politically this culture, to serve as a protection that guarantees any reform or change. Or that development remains within the acceptable limits of this community.

First: Literature Review

First: Education culture:

According to (Deif, 2008), Saudi women, who are described as protected, inaccessible, and conservative, have piqued the world's interest. As a result, (Al Muhaisin, 2008; Al Lily, 2011) notes that this led to the creation of a woman-only campus where they were taught exclusively by women. Due to the dearth of female academics and the rise in female students, male academics could instruct female pupils through the widespread usage of (closed-circuit television, CCTV). (Nakshabandi, 1993).

Two distinct approaches were taken to implement the CCTV system, according to (Nakshabandi, Alageeli, 1997). In one of them, the instructor is seated by himself in a classroom, lecturing to the female pupils who are seated elsewhere, seeing him (the whiteboard) on television screens. The teacher and female students communicate with each other via microphones and speakers. And according to (Al-Saadat, Afifi, 1990) this method has also altered the educational

experience of female students. This raises some questions, including whether female students would rather learn from a man through education or from a face-to-face female teacher.

However, as highlighted by (Al Manaa, 1981), the conservative party was against the proposal, arguing that if women went beyond the primary level of education, they might enter or be connected with the professions of men. According to (El-Sanabary, 1994), Saudi women's admission into formal education changed gender roles in the classroom and gave them access to new social opportunities. The first generation of Saudi women completed their secondary school, and many of them desired to pursue higher education, as demonstrated by (AlMunajjed, 1997).

Second: Educational environment

According to (von Glasersfeld, 1987), knowledge is a human construct that is backed by experience. This idea was initially raised in the eighteenth century and had an impact on Piaget's epistemology, which is regarded as a pioneer in constructivism (theory of learning processes). Von Glasersfeld developed this theory at the Piaget Foundation in the United States and published it formally in 1975. The constructivist perspective holds that knowledge is actively created by fusing new information with what has already been learned and experienced, rather than being passively absorbed from the outside world. "Knowing" is a dynamic, adaptive process that is shaped by one's experiences with the outside world.

Teaching mathematics also aims to enhance learning mathematics, and (Jaworski, 2006) indicated that one problem lies in the relationships between learning, teaching, and teaching practice. Theories help us to analyze or explain, but they do not provide prescriptions for action. They rarely provide direct guidance for practice.

This is confirmed by (Driver, Asoko, Leach, Mortimer, Scott, 1994), that one problem lies in the relationships between learning, teaching, and teaching practice.

Due to the importance of teaching, (Akinoglu, Ruhan, 2007) points out that the way of speaking within the teaching environment does not mean teaching, and listening in the classroom environment does not mean learning, as some learning processes revolve around the teacher, and students are merely passive recipients of information. In the student-centered learning process, the teacher is merely a facilitator or guide; he is the focal point in modern education systems. In all active learning processes, learners learn according to their own needs and pace.

According to (Mangle, 2008) model of problem-based learning in the classroom, students go from being passive information consumers and listeners to becoming active self-learners who solve issues. Additionally, it causes educational programs' emphasis to change from teaching to learning. Instead of being bored in the classroom, it allows pupils to learn new information by posing questions to be addressed. Other qualities like problem-solving, gathering information, sharing information with others, collaboration, communication, etc. are all positively impacted by problem-based learning. Once more, problem-solving is purposeful, serious work that calls for the use of novel techniques, higher-order thinking, and planned, methodical procedures to achieve particular objectives. Getting fact-based information in the classroom is the learning model's main and most crucial objective. also (Major, Baden, Mackinnon, 2000) attest to the fact that students take on a far higher degree of responsibility for their education in classrooms that employ the problem-based learning approach.

According to (Roh, 2003), the primary goal of a teacher in a classroom setting is to support students in their independent learning. This suggests that in problem-solving-based learning environments, teachers' teaching abilities are more significant than in traditional classrooms where the teacher is the center of attention.
Teachers in problem-based learning environments need to involve students in organizing information and applying their knowledge in practical, real-world scenarios, in

addition to imparting knowledge for students to teach mathematics.

According to (Okigbo, Osuafor, 2008) feel that the intended technological, scientific, and commercial applications of mathematics cannot be trusted because of the low math performance of students. Because of this, the method of teaching mathematics in the classroom must enhance students' comprehension of the subject and their performance in it. According to (Okereke, 2006), mathematics is the foundation of science and technology, and it plays a varied and essential role in all areas of science and technology, ensuring that no sector is exempt from its use. (Ukeje, 1986) defined mathematics as the fundamental system for every individual in the learning process and as the mirror of civilization throughout all centuries of laborious calculation.

Due to the importance of the process of teaching mathematics in the classroom environment, (Maduabum, Odili, 2006) point out that mathematics is one of the most poorly taught and widely hated subjects, as students, especially girls, escape from the subject.
Especially in restricted environments. (Hamdan, 2005; Haroun, Abdelfattah, AlSalouli, 2016) attest to the fact that single-gender classrooms in the Kingdom of Saudi Arabia are taught by teachers of the same gender.

Students can study and investigate a range of mathematical ideas in the mathematics lab, as well as use a range of tools and resources to validate different mathematical hypotheses and facts. According to (Igbokwe, 2000), integrating theoretical and practical work in mathematics teaching and learning is facilitated by the use of mathematics laboratories in the classroom.

The benefits of utilizing a math's lab in the classroom were outlined by (Ogunkunle, 2000) and included the following:

- Show practical-related material.

- Experimentation via hands-on labor.

- Keep practical goods in a convenient location.

- Eliminating abstraction and boosting instruction and learning efficiency.

Their meta-analysis, (Voyer, 2014) indicated that female students currently achieve higher academic achievement in mathematics than male students. (Akinfe, Olofimiyi, Fashiky, 2012) attest to the fact that the study's findings suggested that Saudi Arabian math teachers lacked certain qualifications. Additionally, their research showed a connection between pupils' mathematical achievement and the credentials and methods of teachers. Teachers' attitudes about teaching and learning in the classroom were another factor linked to student performance.

Additionally, student results are influenced by instructional strategies and practices. In the classroom, instructional strategies that stimulate students' emotional, cognitive, or physical engagement also impact their learning. According to (Clanet, 2010), there is a connection between instructional strategies that uplift and support kids in the classroom and their academic success. Previous research has also shown a beneficial correlation between student achievement and teaching strategies that place a greater emphasis on student-centered learning processes. (Mamat, Abdullah, Maad, Al-Agili, 2012). According to the findings of (Harounet al., 2016), there are gender disparities in the mathematical content knowledge of Saudi instructors. Specifically, female teachers possess a greater degree of mathematical content knowledge than their male counterparts. considering the attitudes of educators in Saudi Arabia.

Third: Algebra, integration and differentiation in mathematics

According to research, incorporating technology into the classroom can be a difficult and complex process, even though there are many advantages to doing so (Cuban, Kirkpatrick, Peck, 2001).

Second: Previous studies

To provide a clear hierarchy of aims for teaching mathematics to various groups of professions (Technical, Economic, and

Humanitarian), (Maron, 2016) carried out a study titled "Priorities of teaching mathematics in universities." Prioritizing enables concentration on the most crucial objectives of teaching mathematics. This paper, therefore, focuses on figuring out the numerical values of the priorities of the following strategic goals in mathematics education: developing logical thinking skills and mathematical competence for professional task solving. In math class, teaching mathematical culture is important. The mission of teaching mathematics in high school is defined by these similar objectives. Thomas Satie's method of hierarchical analysis, which translates expert qualitative (linguistic) evaluation of goal importance into quantitative values of their priorities, is a trailblazing approach to studying such difficulties. The approach to assessing the significance of goals in mathematics instruction was reorganized and revised by the author. He began by obtaining the numerical values of the priorities and outlining the significance of every objective to fulfill the ultimate goal of advanced mathematics instruction. college. The materials in this article are useful for math teachers, department heads, and academic directors in higher education because the order of objectives makes it possible to emphasize the most crucial ones for the creation of curricula, mathematical specialization programs, and instructional strategies.

And (Ali, Akhter, Khan, 2010) conducted a study entitled “Effect of using problem-solving method in teaching mathematics on the achievement of mathematics students” which aimed to find out the effect of using the problem-solving method on students’ achievement in teaching mathematics. A pretest-posttest design was used in the study. The results were analyzed using mean, standard deviation, and t-test. The results showed:

- Using the problem-solving method improved students’ achievement in mathematics.

- There are statistically significant differences between the effectiveness of the traditional teaching method and the problem-solving method in teaching mathematics at the primary level.

Also, (Okigbo, Osuafor, 2008) conducted a study entitled “Effect of using Mathematics Laboratory in Teaching Mathematics on the Achievement of Mathematics Students” which aimed to identify the effect of using the Mathematics Laboratory in teaching on students’ achievement in Mathematics. The study sample included (100) mathematics students. The research was used quasi-experimental. The results were analyzed using mean, standard deviation, and analysis of covariance (ANCOVA). The results showed:

- Using the mathematics laboratory enhances achievement in mathematics.

- There are no statistically significant differences in the achievement of mathematics students studying in the mathematics laboratory between males and females.

- Using the mathematics laboratory to teach plane geometry and algebraic expression.

- Training mathematics teachers to use classroom methodology.

And (Alotaibi, Khalil, 2021) conducted a study entitled “Teaching Practices of the Mathematics Male and Female Teachers According to the PISA Framework and Its Relation to Their Beliefs towards Their Students.” The study aimed to identify the different teaching practices of mathematics teachers in (Programmed for International Student Assessment, PISA) and its relationship to their beliefs towards their students. The study used the descriptive survey method. The sample consisted of (421) mathematics teachers in the city of Taif. Reliability and validity implications were performed; Two tools were used to collect data: a questionnaire and a scale. The results showed:

- Both genders, male and female teachers, have a high level of formulating mathematics; The average was (2.4840).

- The level of their teaching practices in employing mathematics was high, as the arithmetic average reached (2.3976).

- The level of their teaching practices for the process of explaining mathematics is at an average of (2.2130).

- There are statistically significant differences in the variable of gender, in which females outperformed males, and in teaching experience, in which the most experienced respondents outperformed the inexperienced ones.

- There are no statistically significant differences in favor of the educational level variable.

And also (Alnahdi, Schwab, 2022), conducted a study entitled "The impact of gender differences in teachers' teaching practices and attitudes on students' math and science achievement in Saudi Arabia: Evidence from TIMSS 2019 data" The study aimed to identify the gap. Between genders in achievement results among male and female students. This study aims to verify the existence of a relationship between students' grades and gender differences in teachers' practices and attitudes. TIMSS 2019 data was analyzed in the Kingdom of Saudi Arabia. The data set contains data from (10,817) students, represented by (5,447) female students and (5,370) students who studied mathematics and science, in addition to data from (437) teachers. The results showed:

- Student performance in science and math was favorably correlated with teachers' methods of instruction.

- Student outcomes are favorably correlated with teachers' attitudes toward teaching.

- Students gave female professors higher marks for their practices and had more favorable views concerning teaching.

like that (Ashraf, 2020) conducted a study entitled "Challenges and possibilities in teaching and learning of calculus: A case study of India." The study aimed to introduce calculus, and then teach it to students at the upper secondary level, colleges, and universities, at the expense of algebra and geometry. In introducing incomplete calculus to relatively unprepared students. In line with this proposal, the current research aims to determine how awareness of calculus occurs among learners, what teaching methodologies teachers use, what pedagogical techniques are most efficient in teaching calculus, and what prerequisites are required before starting to teach calculus. And integration. A course in calculus? For this intensive study, the study sample included school teachers and assistant/associate professors in colleges and universities, who have more than (6) years of experience in teaching calculus, drawn from (26 schools, 19 colleges, and 7 university departments), extending across (23) Various states and union territories of India. (142) teachers participated in this study. Data were collected using timelines, classroom observations, focus group interviews, and informal discussions conducted before and after classroom teaching. NVivo and Concordance software were used to analyze emergent content and classroom discourses. The study, which extends between February (2016 and April 2019), is qualitative in its framework and falls purely within the interpretive model. The results of this research should improve the understanding of calculus perception among school, college, and university students. The results showed:

If teachers want students to understand integration, they need experience working in the classroom environment.

- Learners need to have a deeper knowledge of concepts.

- That teachers engage in presentations, which leads to tangible results in learners' achievement, is a proven alternative in enhancing the content and educational understanding of in-service teachers.

- It is seen how disturbed our schools and colleges are by the nature and approach of teaching calculus to learners.

Conducted (Demo, Garzetti, Santi, Tarini, 2021) a study entitled "Learning Mathematics in an Inclusive and Open Environment: An Interdisciplinary Approach." The study aimed to recognize the need for learning environments with differentiation strategies for all. We have

developed a model of inclusive mathematics learning, based on objectification theory and a broad idea of differentiation achieved through open learning. It raises an interdisciplinary research issue that requires collaboration between two sub-disciplines related to the field of educational studies: inclusive education and mathematics education. The results showed:

- Theory and practice, the result of which is a teaching and learning model to be included in mathematics. The construction of the teaching and learning model moves along two complementary paths: (1) Regarding the theoretical point of view, we implemented the linking of theoretical strategies with the Open Learning Network and the theory of objectification; (2) Regarding the methodological point of view, we carried out educational design research.

- The new teaching and learning model is the result of theoretical and methodological verification in real contexts according to an interdisciplinary approach.

conducted (Martin, 2002) a study entitled "The classroom environment and its effects on the practice of teachers." The purpose of the study was to examine how classroom environments are designed and how this affects the practices of teachers. utilizing teacher interviews and lesson observations. Tools for behavioral mapping have been created to gather data, and both qualitative and quantitative analysis come next. Numerous constructs have been created, recognized, and applied to evaluate classroom activities. A few of these structures are data-set-containing, instructional, and physical (such as planning patterns). The following were linked to the results:

- Examining how teachers behaved in the classroom in relation to concerns that came up during their interviews, wherein the rooms' flexibility factors varied from 56 to 99%; 88% of the rooms needed to have a flexibility component that was greater than 80% of their overall area. This can seem like a lot, and that's because a significant portion of the class is editable based on these definitions. Given that teachers spend 79% of the lesson time instructing the entire class, the study raises concerns regarding the awareness of teachers in their immediate surroundings. For student tasks, there isn't a set of exercises in this lesson.

- The degree to which this knowledge influences their instruction given that the teacher always sits in the front of the class with a 20% mobility factor and a 50% degree of centralization. The public space has a 99% flexibility factor and is arranged in rows.

- The extent to which teachers feel they control the features of their classrooms.

Additionally, a study named "Examining the Relationship between Teacher Leadership and School Climate" was carried out (Kilinç, 2014). The purpose of the study was to investigate the connections between teacher leadership and views of the classroom environment. 259 instructors who attended the educational conference in the (Bafra region of Samsun Governorate), which was arranged by the Directorate of National Education, were included in the sample. The Teacher Leadership Scale and the Organizational Climate Description Questionnaire were employed in the data collection process. The outcomes revealed:

- There are negative and significant relationships between (CCE) and teacher leadership.

- The (CCE) negatively and significantly predicted all three subscales (institutional improvement, professional improvement, and collaboration among colleagues) of teacher leadership.

- (OCE) is the only positive and important indicator of teacher leadership based on institutional improvement.

Methods and Procedures

This chapter deals with a presentation of the study methodology in terms of the study population, study sample, study tools, and statistical treatment.

Research approach:

This study is based on the use of the descriptive, correlational approach to suit the purposes of the study related to comparing (CCE) and (OCE) in teaching mathematics from the perspective of female students.

Population and Sampling

The study population consisted of female students at King Faisal University in the Kingdom of Saudi Arabia (in the central region - Al-Ahsa).

The study population consists of (18-20) years of age.

Sample

The study population included (31) female students, divided into (17) female students in (OCE) and (14) female students in (CCE). The purposive sample was chosen, as the female students studying at King Faisal University in the Kingdom of Saudi Arabia. The following Table (1) shows the demographic distribution of the study sample, and the demographic Table (1) shows the distribution of subjects:

Table (1) Distribution of study sample members by type of classroom and number of female students.

Classroom type	Number of female students	Ratio
Open Classes	17	%54.84
Closed Classes	14	%45.16

Table (1) shows that a percentage of (54.84%) of the study sample members are female students from (OCE) and their number is (17), and a percentage of (45.16%) are female students from (CCE) and their number is (14).

The study tools

The tool: A mathematics scale to detect the effect of (CCE) and (OCE) on arithmetic operations, which the researcher developed.

Description of the scale: This scale consists of a set of subtests (4) and (46) items.

The scale was prepared from the undergraduate mathematics curriculum, which was designed for this purpose, and it is a combination of individual and collective scales.

The scale items were distributed as follows:

1- Differentiation and Integration: Number of terms (9).

2- Algebra: Number of terms (14).

3- Probability and Statistics: Number of terms (12).

4- Geometric shapes: Number of terms (11).

debug key:

The minimum mark and the highest mark were determined for the student's achievement on the four tests related to calculus, algebra, statistics, probability, and geometric shapes. They are (the lowest mark = 0, and the upper mark = 100), and the value (60) was adopted as the cut-off point as a mark of the student's success, raising the level of understanding and obtaining their skills. The following equation was applied to determine the student's level on the four tests, noting that each test has a score out of (100).

Study Procedures

To achieve the objectives of the study, the following measures were taken:

1- A Pilot Study (n = 5) was applied to the sample to verify the extent of linguistic formulation and the application and correction procedures.

2- The scale, which was prepared for female university students in mathematics, was applied to a sample (n=31).

3- The data was processed statistically according to the appropriate methods mentioned in the study.

4- The tests were divided into categories according to the type of test (calculus, algebra, probability and statistics, geometric shapes).

5- The classroom environment was divided into (CCE) and (OCE).

6- Indications were reached about the validity and reliability of the measures.

Statistical treatment

To answer the study questions, the following statistical methods were used:

- Extracting correlation coefficients using the Pearson Correlation test to verify the validity implications of the measurement tool.

- Extracting stability coefficients using the Split-Half method to verify the stability of the measuring instrument.

- Using arithmetic means and standard deviations, the Paired Sample T-test and the Two Way-ANOVA test were also used.

Results and Discussion

The study's findings were sorted into the following categories:

The First question: What are the implications of the validity of the comparison between the closed classroom environment and the open classroom environment in teaching mathematics to female university students?

The Validity of the study variables was checked as follows:

1- Content Validity

The Content Validity of the scale was verified by presenting it to (4) arbitrators with expertise and experience in special education, some (4) experts in psychology, and (6) experts in mathematics. The arbitrators expressed their opinions on the content of the scale in terms of the clarity of the paragraphs and linguistic formulation, and the arrangement and sequence of the tests considering the student's ability to answer, which confirms the apparent validity of the scale at a rate of (80%).

2- Validity of peripheral comparison

To verify the validity of a peripheral comparison between (OCE) and (CCE) in teaching mathematics to female undergraduate students, the Pearson Correlation test was used, the results of which appear in the following table (2):

Table (2) Correlation coefficients using the Pearson Correlation test to verify the validity of the comparison between (CCE) and (OCE) in teaching mathematics to female undergraduate students

		Differentiation and Integration (CCE)	Algebra (CCE)	Statistics and probability (CCE)	Geometric shapes (CCE)
Differentiation and Integration (OCE)	Pearson Correlation	-.144-			
Algebra (OCE)	Pearson Correlation		-.033-		
Statistics and probability (OCE)	Pearson Correlation			.094	
Geometric shapes (OCE)	Pearson Correlation				-.105-

The results of Table (2) showed that the value of the correlation coefficient between teaching mathematics about Differentiation and Integration in (OCE) and (CCE) was (-0.144), and the value of the correlation coefficient between teaching algebra in (OCE) and (CCE) was (-0.033), and the value of the correlation coefficient between teaching statistics in (OCE) and (CCE) was (0.094), and the value of the correlation coefficient for teaching geometric shapes in (OCE) and (CCE) was (-0.105), which are not statistically significant values. At the significance level (0.05), this indicates the validity of the comparison (Pallant, 2005), meaning that there is a distinction between teaching mathematics with (OCE) and (CCE) for female undergraduate students.

The Second question: What are the implications of the Reliability of the comparison between the closed classroom environment and the open classroom

environment in teaching mathematics to female university students?

The Reliability of the study variables was checked as follows:

The reliability of grades, which is considered a tool for the study, was calculated through the extent of consistency of the grades obtained on mathematics teaching materials using the split-half method, where the grades on the (CCE) were considered one part, and the second part was the summation of the grades on the (OCE), as it was shown that the value of the Cronbach alpha reliability coefficient for the grades on the (CCE) (Part1 = 0.951, and the value of the Cronbach's reliability coefficient alpha for the scores on the (OCE) (Part2 = 0.919), and it was found that the correlation coefficient between the first part and the second part Part1 + Part2 = 0.959, and the value of the Guttman coefficient for split-half = 0.978, which are acceptable reliability values For the current study (Hair et al., 2010), Table (3) shows this.

Table (3) Coefficients of Reliability Environment (CCE) and (OCE) in teaching mathematics to female undergraduate students

Cronbach alpha	**Part 1**	**value**	.951
		Number of paragraphs	9[a]
	Part 2	**value**	.919
		Number of paragraphs	9[b]
	Total paragraphs		18
Correlation coefficient between part 1 and part 2			.959
Guttman Split-Half Coefficient			.978

The Third question: Are there statistically significant differences at the significance level (0.05) between the closed classroom environment and the open classroom environment in teaching mathematics to female university students?

To answer this question, the Paired Sample T-test was used to identify the differences between the environment (CCE) and (OCE) in teaching mathematics to female university students, and Table (4) shows this:

Table (4) Paired Sample T-test to identify the significance of the differences between (CCE) and (OCE) in teaching mathematics to female university students

Source	Mean	Std. Deviation	Mean difference	t	Sig
Differentiation and Integration (OCE)	83.43	10.97	2.00	.362	.723
Differentiation and Integration (CCE)	81.43	16.04			
Algebra (OCE)	79.00	12.33	-3.93	-.753-	.465
Algebra (CCE)	82.93	14.73			
Statistics and probability (OCE)	86.00	9.21	4.00	1.160	.267
Statistics and probability (CCE)	82.00	9.95			
Geometric	86.57	8.38	12.64	2.679	*.019

shapes (OCE)					
Geometric shapes (CCE)	73.93	14.69			

The results of Table (4) showed that the arithmetic mean of differentiation and integration in (OCE) was (83.43) with a standard deviation of (10.97), and the value of differentiation and integration in (CCE) was (81.43) with a standard deviation of (16.04). The difference in the arithmetic averages between (OCE) and (CCE) was (2.00), and it was noted that the arithmetic average level of differentiation and integration in (OCE) was higher than the level in (CCE), and the value of the (t) statistic reached (0.362). The differences between the arithmetic mean, if any, did not reach the level of statistical significance.

The arithmetic mean of algebra in (OCE) was (79.00) with a standard deviation of (12.33). While the arithmetic mean value of algebra in (CCE) was (82.93) with a standard deviation of (14.73). The difference in the arithmetic averages between (OCE) and (CCE) was (-3.93). It is noted that the arithmetic average level for algebra in (CCE) is higher than the level in (OCE). The value of the t-statistic was (-0.753), and the differences between the arithmetic mean, if any, did not reach the level of statistical significance.

The results of Table (4) showed that the arithmetic mean value of statistics and probabilities in (OCE) was (86.00), with a standard deviation of (9.21). While the arithmetic mean value of statistics and probability in (CCE) was (82.00) with a standard deviation of (9.95). The difference in the arithmetic means between (OCE) and (CCE) was (4.00). It is noted that the level of the arithmetic mean of statistics and probability in (OCE) is higher than the level in (CCE). The value of the t-statistic was (1.160), and the differences between the arithmetic mean, if any, did not reach the level of statistical significance.

The results shown in Table (4) showed that the arithmetic mean value for open geometric shapes in (OCE) was (86.57) with a standard deviation of (8.38). While the arithmetic mean value for open geometric shapes in (CCE) was (73.93) with a standard deviation of (14.69). The difference in the arithmetic averages between (OCE) and (CCE) was (12.64). It is noted that the arithmetic average level for geometric shapes in (OCE) is higher than the level in (OCE). The value of the t-statistic was (2.679), which is a statistically significant value at the significance level (0.05). The difference in the level of geometric shapes was in favor of the open environment.

The Fourth question: Are there statistically significant differences between the closed classroom environment and the open classroom environment in teaching mathematics to female university students due to the variable type of teacher?

Arithmetic means and standard deviations were extracted, and the Two-Way MANOVA test was used to identify the comparison between (CCE) and (OCE) in teaching mathematics to female university students due to the variable of teacher type and teaching method.

Table (5) Arithmetic means and standard deviations to identify the comparison between (CCE) and (OCE) in teaching mathematics to female university students due to the variable type of teacher and his teaching method.

Teaching - Mathematics	**Type of Meacher/Teaching method**	**Mean**	**Std. Deviation**	**N**
Differentiation and Integration	Female teachers (OCE)	83.53	11.49	17
	Male teachers (CCE)	81.43	16.04	14
	Total	82.58	13.53	31
Algebra	Female teachers	80.00	12.01	17

	(OCE)			
	Male teachers (CCE)	82.93	14.73	14
	Total	81.32	13.16	31
Statistics and probability	Female teachers (OCE)	86.41	8.43	17
	Male teachers (CCE)	82.00	9.95	14
	Total	84.42	9.26	31
Geometric shapes	Female teachers (OCE)	86.12	8.15	17
	Male teachers (CCE)	73.93	14.69	14
	Total	80.61	12.92	31
Total	Female teachers (OCE)	84.01	10.27	68
	Male teachers (CCE)	80.07	14.13	56
	Total	82.23	12.27	124

Table (5) shows that are apparent differences between the values of the arithmetic averages for the comparison between (CCE) and (OCE) in teaching mathematics to female university students due to the variable of the type of teacher and his teaching method. To determine the significance of the differences, a two-way variance test was used, the results of which appear in Table 6 below:

Table (6) Two Way ANOVA test to identify the significance of the differences in the comparison between (CCE) and (OCE) in teaching mathematics to female university students due to the variable of teacher type and teaching method.

Source	Type III Sum of Squares	df	Mean Square	F	Sig
Teaching -Mathematics	258.992	3	86.331	.578	.631
Type of Meacher / Teaching method	477.518	1	477.518	3.195	.076
Error	17787.708	119	149.477		
Total	857063.000	124			
Corrected Total	18524.218	123			

It is noted from Table (6) that the value of the statistic (F) was (0.578) for the variance in the level of the mathematics teaching method, which is (integration and differentiation, algebra, statistics, probability, and geometric shapes), which is a value that is not statistically significant at the significance level (0.05). The differences between the arithmetic mean values, if any, did not reach the level of statistical significance.

The results showed that the statistical value (F) was (3.195) for the variation in the type of teacher and his teaching method (for integration and differentiation, algebra, statistics, probability, and geometric shapes). It is a non-significant value at the significance level (0.05). The differences between the arithmetic mean values, if any, did not reach the level of statistical significance.

Discussion

1- What are the implications of the validity of the comparison between the closed classroom environment and the open classroom environment in teaching mathematics to female university students?

The results of the study showed that Content Validity represented (80%). The Validity of peripheral comparison reached the value of the correlation coefficient between teaching mathematics in (CCE) and (OCE) for Differentiation and Integration (-0.144), teaching algebra (-0.033), teaching statistics (0.094), and teaching geometric shapes (-0.105). These values are not statistically significant at the significance level (0.05). That is, there is a distinction between teaching

mathematics to (OCE) and (CCE) to female undergraduate students.

- Researcher's interpretation: The validity parameters in any of the previous methods are considered acceptable and good. This indicates that the scale has validity indications that encourage its use in the Saudi environment.

2- What are the implications of the Reliability of the comparison between the closed classroom environment and the open classroom environment in teaching mathematics to female university students?

The results of the study showed that the reliability of the split-half method on (CCE) was (Part1 = 0.951), and on (OCE) it was (Part2 = 0.919), that is, the split-half coefficient was (0.978). And the Cronbach's alpha reliability coefficient was (0.959).

- Researcher's interpretation: The stability coefficients in any of the previous methods are considered acceptable and good. This indicates that the scale has stability indications that encourage its use in the Saudi environment.

3- Are there statistically significant differences at the significance level (0.05) between the closed classroom environment and the open classroom environment in teaching mathematics to female university students?

The results showed that there are no statistically significant differences at the significance level (0.05) between (CCE) and (OCE) for Differentiation and Integration. There are differences in algebra in favor of (CCE), there are differences in statistics and probability in (OCE), and there are differences in geometric shapes in (OCE).

- The results of this study agreed with (Ali, Akhter, Khan, 2010) that using the problem-solving method led to improving students' achievement in mathematics, as well as the existence of differences between the effectiveness of the traditional teaching method and the problem-solving method in teaching mathematics. And (Demo, Garzetti, Santi, Tarini, 2021) that theoretical strategies must be implemented and linked to open education. And with (Martin, 2002) the positive feeling of teachers is that they control the features of their classrooms, as well as with flexible classes. Additionally, according to (Ashraf, 2020), for teachers to help students comprehend Differentiation and Integration, they must have prior classroom experience, students must have a deeper understanding of the concepts, and teachers must participate in the presentations to see observable improvements in student achievement. Learners and it is a tried-and-true substitute for improving the course material and in-service teachers' comprehension, as well as our schools' and colleges' discomfiture with the style and method of teaching Differentiation and Integration to learners.

- Researcher's interpretation in the classroom, mathematics needs collaboration and the application of instructional strategies. All of the subjects in (OCE) had higher grades than (CCE) based on the statistical analysis of the student's grades: differentiation and integration, probability and statistics, and geometric shapes. This could be because these subjects require activities and educational resources like engineering tools and teaching techniques, as well as interactions with female students in the classroom.

4- Are there statistically significant differences between the closed classroom environment and the open classroom environment in teaching mathematics to female university students due to the variable type of teacher?

The results of the study showed that there are no statistically significant differences at the significance level (0.05) between (CCE) and (OCE) due to the variable of teacher type.

- The results agreed with (Maron, 2016) on the importance of developing curricula, programs for sports specializations, and the method and location of teaching. And with (Okigbo, Osuafor, 2008) training mathematics teachers to use systematic classes.

- The results of this study differed with (Alotaibi, Khalil, 2021) in that the level of their teaching practices in employing mathematics was high, and there was a gender variable in which females outperformed males. However (Alnahdi, Schwab, 2022) that female teachers

have positive attitudes towards teaching. With (Kilinç, 2014) there are negative and significant relationships between the restricted teaching climate and teacher leadership, and the restrictive environment negatively and significantly predicts all three sub-measures (institutional improvement, professional improvement, and cooperation among colleagues) for teacher leadership, and that the teaching climate in the open environment is the indicator. The only positive and important teacher leadership is based on institutional improvement.

- Researcher's interpretation: As for (Algebra), the female students' grades in (CCE) were slightly higher than in (OCE). The reason may be that algebra does not require teaching aids, and explanation on the traditional blackboard is sufficient in both (OCE) and (CCE) semesters. However, we recommend that even the subject of algebra be in (OCE). Also, the subject of calculus may not require teaching aids, and female (OCE) students outperformed female (CCE) students, so from these results, (OCE) is important during the explanation of mathematics.

Recommendations:

• Educational recommendations:

- Teaching female students through OCE.

- Interest in methods of teaching mathematics through (OCE).

- Developing teachers' attitudes towards a flexible teaching method.

• Suggestions for research purposes.

- Conduct more studies and research related to (OCE) and (CCE) and their impact on mathematics.

- Conduct further studies and research related to educational methods in teaching mathematics to (OCE).

- Conduct more studies and research related to the psychological aspects associated with (CCE).

Reference

[1] Akinfe, E., Olofimiyi, O. E., and Fashiky, C. O. (2012). Teachers' quality as correlates of students' academic performance in biology in senior secondary schools in Ondo state, Nigeria. J. Educat. Res. 1, 108–114.

[2] Akinoglu, O. & Ruhan, O. T. (2007). The Effect of Problem- Based active Learning in Science Education on Students' Academic Achievement, Attitude and Concept Learning. Eurasia Journal of Mathematics, Science & Technology Education, 3(1), 71-81.

[3] Al Lily, A. E. (2011). On line and under veil: Technology-facilitated communication and Saudi female experience within academia. Technology in Society, 33(1-2), 119-127.

[4] Al Manaa, A. (1981). Economic Development and its Impact on the Status of Women in Saudi Arabia, Unpublished PhD Thesis. Boulder: The University of Colorado.

[5] Al Muhaisin EA, Shawat AM. Nitam al-entisab fi al-Mamlakah alArabiah al-Saudyah wa khatawat nahwa al-taaleem al-elaktrooni 'Al-Entisab system in Saudi Arabia and steps towards e-learning. Paper presented at the Second International Conference and Exhibition for Zen Centre for E-learning, held in Bahrain, for the period from 28–30 April, 1-18. Available at, http://www.mohyssin.com/ Download/research/doc/BahrainConf.doc; 2008 [accessed 29.03.11].

[6] Al-Agili, M. Z. G., Mamat, M. B., Abdullah, L., and Maad, H. A. (2012). The factors influence students' achievement in mathematics: a case for Libyan's students. World Appl. Sci. J. 17, 1224–1230.

[7] Ali, R., Akhter, A., & Khan, A. (2010). Effect of using problem solving method in teaching mathematics on the achievement

of mathematics students. Asian Social Science, 6(2), 67.

[8] AlMunajjed M. Women in Saudi Arabia today. London: Macmillan; 1997.

[9] Alnahdi, G. H., & Schwab, S. (2022). The impact of gender differences in teachers' teaching practices and attitudes on students' math and science achievement in Saudi Arabia: Evidence from TIMSS 2019 data. Frontiers in Psychology, 14, 1066843.

[10] Alotaibi, A., Khalil, I., & Wardat, Y. (2021). Teaching Practices of the Mathematics Male and Female Teachers According to the PISA Framework and Its Relation to Their Beliefs towards Their Students. Online Submission, 20(1), 1247-1265.

[11] Al-Saadat, A., & Afifi, E. (1990). Teaching English via Closed-Circuit Television in a Sex-Segregated Community. British journal of educational technology, 21(3), 175-82.

[12] Ashraf, A. L. A. M. (2020). Challenges and possibilities in teaching and learning of calculus: A case study of India. Journal for the Education of Gifted Young Scientists, 8(1), 407-433.

[13] Clanet, J. (2010). The relationship between teaching practices and student achievement in first year classes. A comparative study of small size and standard size classes. Eur. J. Psychol. Educ. 25, 192–206. doi: 10.1007/s10212-010-0012-y.

[14] Cuban, L., Kirkpatrick, H., & Peck, C. (2001). High access and low use of technologies in high school classrooms: Explaining an apparent paradox. American educational research journal, 38(4), 813-834.

[15] Deif F. Perpetual minors: human rights abuses stemming from male guardianship and sex segregation in Saudi Arabia. London: Human Rights Watch. Available at, http://www.hrw.org/sites/default/files/reports/saudiarabia0408webwcover.pdf; 2008 [accessed 29.03.11].

[16] Demo, H., Garzetti, M., Santi, G., & Tarini, G. (2021). Learning mathematics in an inclusive and open environment: An interdisciplinary approach. Education Sciences, 11(5), 199.

[17] Driver, R.; Asoko, H.; Leach, J.; Mortimer, E.; Scott, P. Constructing Scientific Knowledge in the Classroom. Educ. Res. 1994, 23, 5–12.

[18] El-Sanabary N. Female and education in Saudi Arabia and the reproduction of gender division. Gender and Education 1994;6(2): 145–50.

[19] Gallagher EB, Searle CM. Health services and the political culture of Saudi Arabia. Social Science & Medicine 1985;21(3):251–62.

[20] Hair, J. F; Black, W. C; Babin, B. J; Anderson, R. E & Tatham, R. L, (2010),"Multivariate Data Analysis ", 7th edition., New York:

[21] Hamdan, A. (2005). Women and education in Saudi Arabia: Challenges and achievements. Int. Educ. J. 6, 42–64.

[22] Haroun, R. F., Ng, D., Abdelfattah, F. A., and AlSalouli, M. S. (2016). Gender difference in teachers' mathematical knowledge for teaching in the context of single-sex classrooms. Int. J. Sci. Math. Educ. 14, 383–396. doi: 10.1007/s10763-015-9631-8

[23] Igbokwe DI (2000): Dominant factors and Error Types inhibiting the understanding of Mathem-atics. 41 st Annual Conference Proceedings of STAN, 242-249.

[24] Jaworski, B. Theory and practice in mathematics teaching development: Critical inquiry as a mode of learning in teaching. J. Math. Teach. Educ. 2006, 9, 187–211.

[25] Kilinç, A. Ç. (2014). Examining the Relationship between Teacher Leadership and School Climate. Educational Sciences: Theory and Practice, 14(5), 1729-1742.

[26] Maduabum MA, Odili GA (2006) Analysis of students' performance in General Mathematics at SSCE level in Nigeria 1991-2002. J. Res. curriculum teach. 1(1): 64-68.

[27] Major, C. H., Baden, M. S. & Mackinnon, M. (2000). Issues in Problem Based leaning: A Message from Guest Editors. Journal on Excellence in College Teaching, USA, Web Edition, 11, 3.

[28] Mangle, S. K. (2008). Advanced Educational Psychology (2nd Edi). Prentice Hall of India New Delhi. Pp.378-380.

[29] Maron, A. I. (2016). Priorities of teaching mathematics in universities. International Electronic Journal of Mathematics Education, 11(9), 3339-3350.

[30] Martin, S. H. (2002). The classroom environment and its effects on the practice of teachers. Journal of Environmental Psychology, 22(1-2), 139-156.

[31] Nakshabandi, A. A. (1993). A comparative evaluation of a distant education course for female students at King Saud University. International Journal of Instructional Media, 20(2), 127-36.

[32] Nakshabandi, A. A., & Alageeli, M. (1997). A preliminary investigation of the effectiveness of two alternative forms of distance education for female students in Saudi Arabia. Majalat Kuliyat Altarbyah, 12(14), 1-30.

[33] Ogunkunle RA (2000). Teaching of mathematics in schools. The laboratory Approach. The Nigeria Teacher Today, 8 (1,2): 180-184.

[34] Okereke SC (2006) Effects of prior knowledge of implications of mathematical tasks /concepts to career types and gender on students' achievement, interest and retention. In U. Nzewi (Ed) STAN procedures of the 47 th Annual conference, 253-259.

[35] Okigbo, E. C. & Osuafor, A. M. (2008). Effect of using Mathematics Laboratory in Teaching Mathematics on the Achievement of Mathematics Students. Educational Research and Review, 3(8), 257-261.

[36] Pallant, J., (2005), SPSS survival manual: a step-by-step guide to data analysis using SPSS for windows (Version 12). 2nd ed. Maidenhead: Open University Press.

[37] Roh, K. H. (2003). Problem Based learning in Mathematics. ERIC Clearing house for Science Mathematics and Environmental Education. [Online] Available: http://www.ericdigests.org/2004-/math.html (April 20, 2009).

[38] Ukeje BO (1986) Education for Social Reconstruction London, Macmillan.

[39] von Glasersfeld, E. Learning as a Constructive Activity. In Problems of Representation in the Teaching and Learning of Mathematics; Janvier, C., Ed.; Lawrence Erlbaum: Hillsdale, NJ, USA, 1987; pp. 3–17.

[40] Voyer, D., and Voyer, S. D. (2014). Gender differences in scholastic achievement: a meta-analysis. Psychol. Bull. 140, 1174–1204. doi: 10.1037/a0036620.