International Journal of Innovation, Creativity and Change. www.ijicc.net
Volume 14, Issue 11, 2020

The Effectiveness of the Learning Stations Strategy on Developing Mathematical Power and Mindfulness for Elementary Classroom Student Teachers at Al– Zaytoonah University of Jordan

Dr. Ziad Nemrawi[a], Dr. Mofeed Abu Mosa[b], [a]Associate Prof. Al-Zaytoonah University of Jordan, Faculty of Arts / Department of Education, [b]Associate Prof. Arab Open University, Faculty of Arts / Department of Education, Email: [a]drziadnemrawi@gmail.com

This study aimed at investigating the effectiveness of using the learning stations strategy in developing the mathematical power and mindfulness of elementary classroom student teachers at Al-Zaytoonah University of Jordan. The purposive research sample in this study consisted of two groups of elementary classroom student teachers: an experimental group (30 students) who studied geometrical topics by means of the learning stations strategy and a control group (28 students) who studied the same geometrical topics via traditional methods. To achieve the aims of this study two tests were designed to measure mathematical power: a mathematical knowledge test and a mathematical processes test. In addition, a mindfulness scale was also utilised by the researchers in this study. Pre- post-tests were conducted on both groups; moreover, the data was analysed using independent samples and Eta square. The results revealed the effectiveness of learning the stations strategy in improving both mathematical power (i.e. mathematical knowledge and mathematical processes) and mindfulness for elementary classroom student teachers.

Key words: *learning stations, mathematical power, mathematical mindfulness*

Introduction

In recent years, the Learning Stations Strategy has gained wide critical attention. This teaching strategy involves allowing small groups of students to pass through various learning stations which are designed in a way that takes into account the countless characteristics of learners and their different abilities. In addition, it makes both the learning and teaching processes more efficient.
Jones (2007) was the first theorist to use the term 'learning station strategy' as a solution to the shortage of educational resources in the classroom as well as a way to overcome the students' boredom due to the use of traditional teaching methods. This strategy divides students into different learning stations. In these stations, students receive teaching materials and resources to develop and build their cognitive knowledge. It is a constructivist approach that is based on the idea that learning will occur when teachers guide and supervise learners during their interactive engagement in group activities.

Bulunuz and Jarrett (2010) observed that the learning stations strategy is derived from the social constructivist theory as it confirms that the person builds his / her knowledge and thoughts through the interaction with others. Accordingly, learning mathematics is a mental activity connected to and integrated with the social and cultural process (Nemrawi , 2020).

Gercek and Ozcan (2016) believe that the learning stations strategy is based on groups of diverse educational activities and experiences which are divided into learning stations. Such activities include reading, exploratory, visual activities, computer tasks…..etc so that there is an activity for each station which is different from the other ones. The students in small groups will move from one station to another so that each student can experience all the educational activities, Zaydan (2019) signified that there are several types of learning stations such as :

Reading Station: this depends on reading word problems provided by teachers in order to give the students the chance to achieve and master learning skills and depend on themselves in building their knowledge and generating ideas. For example, the mathematic teachers can provide a word problem and students will read and understand it by themselves then they will determine the method to solve it.

Exploratory Station: in this station, the students engage in an analytical process, explain deep thoughts and ideas and search for solutions by asking questions and contemplating mathematical questions to reach answers using a logical argument. Therefore, in these stations, students develop mathematical inference.

Visual station: this depends on showing pictures, drawings, charts, sketches, all of which help students to understand mathematical concepts and improve mathematical connection skills, thereby increasing students' ability to express their own thoughts and solutions to others.

E-Station: this depends on using the computer and its applications to learn any topic. For example, students may be introduced to geometric concepts and their applications in space or in the deep sea by using computers**.**

Ediger (2011) indicated that the learning stations strategy is characterised as flexible since it takes into account students' individual differences, characteristics and educational needs. In addition, Zaydan's (2019) study concluded that the learning stations strategy helps Jordanian seventh grade students to learn geometrical concepts and it improves their attitude towards learning geometry.

Khaji and Rasheed (2016) stated that learning stations play a major role in improving students' performance in mathematics. Hassan (2013) noted in his study that learning stations have played a positive role in increasing students' ability in solving mathematical problems and developing positive attitudes toward learning mathematics.

Mathematical Power

Mathematical power is the main purpose of teaching mathematics and it needs some creative and untraditional teaching methods; in fact, it requires highly professional teachers**.** (Senaidi and Abed, 2019).

The National Council of Teachers of Mathematics (NCTM) emphasises the importance of mathematical power as a standard for mathematical assessment. Therefore, maths teachers should take into account mathematical power in the teaching process and consider it as one of the most important criteria for mathematical assessment. The concept of mathematical power means that students will possess real abilities in the fields of mathematical knowledge such as: conceptual knowledge, procedural knowledge and problem-solving knowledge. Moreover, mathematical power means that students should have capabilities in mathematical processes such as connection, communication and reasoning (NCTM, 2000). Accordingly, mathematical power consists of certain dimensions namely:

1. Mathematical Knowledge: this includes students' abilities in three areas of mathematical knowledge: conceptual knowledge, procedural knowledge, and problem solving. Procedural knowledge is the student's ability to perform calculations, algorithmic procedures and to use mathematical rules; on the other hand, conceptual knowledge

involves the student's ability to recognise, define, model, interpret and build conceptual maps that connect related mathematical concepts with each other, and represent them in multiple ways. Problem solving is at the heart of mathematical learning. A maths problem can be defined as new a situation that needs numerous strategies to be solved, so it is a kind of question which is new and needs to be explored.

2. <u>Mathematical Processes</u>: these processes include mathematical communication, connection, and reasoning. Mathematical communication is the student's ability to interact with his colleagues using mathematical language and symbols to express his thoughts and ideas. It also includes the student's ability to express mathematical ideas through the effective use of graphs, drawings, forms, and shapes. As for mathematical connection, it involves the student's ability to connect mathematical concepts with each other and with his/ her daily life as well as the various applications of maths in different domains of science. Moreover, mathematical reasoning concerns the student's ability to investigate the relationships among mathematical ideas, and to use both deductive and inductive reasoning to find the correct answers based on logical arguments.

3. <u>Mathematical content:</u> this includes mathematical topics such: Numbers and operations; Algebra, Geometry; Mensuration; and Data analysis and probability. (Qubeilat and Migdady, 2014).

It is clear that mathematical power dimensions are integrated and intertwined; therefore, experienced teachers can present any maths topic through well designed problems and activities that cover most of the mentioned dimensions, thereby enhancing the learning process.

There is an increasing interest in teaching with mathematical power. It has become a trend in the field of teaching and learning in general and it is used as a tool to assess students.

In that respect, Pujiastuti and Rafianti (2017) analysed to what extent students attain mathematical power and they found that only a few students have high levels of mathematical power whereas the majority of students are particularly weak in the field of mathematical reasoning.

In Abu Sakran's (2017) study, he found that training students in the dimension of mathematical power increases their mathematical achievement and they develop mathematical thinking and communication skills.

Similarly, Al-Khateeb (2017) found that an education program based on mathematical power had a significant impact in the development of Algebraic reasoning and solving Algebraic problems for eighth graders. In addition, several studies such as Qubeilat & Migdady (2014). Senaidi & Abed (2019), and Kusmaryono & Suyitno (2015) indicated that there is a great role for mathematical power in developing conceptual understanding for students during their mathematical learning.

Mindfulness

The development of mindfulness for students is essential these days. Fisher (2006) indicated that students in this technological age are distracted by the tremendous amount of audio and visual effects from photos, videos, and audio recordings they encounter all of which hamper their ability to think through the learning process.

Mindfulness means attention, awareness and concern with learning experiences. Mindfulness refers to the attention to and awareness of learning experiences (Leland, 2015). In addition, mindfulness includes the selective attention of students as well as students' acceptance of learning experiences with readiness and enthusiasm through the use of reflection during the learning process instead of hasty judgments (Shenck, 2011).

Omar (2018) indicated that when mindfulness was employed in the educational process, it developed the students' ability in building their knowledge and motivated them to learn actively and effectively. Consequently, mindfulness in teaching mathematics is connected to the development of students' confidence in their mathematical capabilities and thus motivates them to achieve success (Ghasem & Soleymani, 2016).

Based on the above literature review, it is noted that the learning stations strategy has been proven to be effective in the teaching process. Therefore, researchers find that it is useful to employ this strategy to develop mathematical power for students, to help them generate in depth maths knowledge and become engaged in solving mathematical problems in a rich learning environment based on experiences and diverse activities. Based on the role played by mindfulness in motivating students towards learning, the need to study the impact of learning stations on the development of mathematical power and mindfulness comes to the fore. In that respect, this research may be considered one of the rare studies that linked between learning stations, mathematical power and mindfulness.

Problem Statement:

According to various studies, students in Jordan face lots of difficulties in learning mathematics. These studies mainly refer to traditional teaching strategies used by the majority of mathematics teachers. Such traditional strategies focus on routine calculations, memorisation of rules and facts without understanding, all of which reinforces the passive role of students in learning concepts and skills (Nemrawi , 2020 ; Zaydan, 2019; Qubeilat & Migdady , 2014 ; Senaidi & Abed , 2019).

The researchers observed during their teaching in the undergraduate program for Elementary Grades classroom Student Teachers that students at the university level suffer from an overall lack of focus in the classroom. Such findings confirm the deficiency of mindfulness for classroom students. These observations were shared with faculty members and colleagues.

Related educational literature has emphasised the significance of mathematical power as essential to assessing students in learning Mathematics. (NAEP, 2003; ECTM, 2000).

This study aims at investigating the effectiveness of using the learning stations strategy on developing mathematical power and mindfulness for Elementary Grades classroom Student Teachers; specifically, the study addressed the following three questions:

Research Questions:

1. How effective is using the learning stations strategy in developing Elementary Grades Classroom Student Teachers' abilities in mathematical knowledge (Procedural Knowledge, Conceptual Knowledge, Problem Solving)?

2. How effective is using the learning stations strategy in developing Elementary Grades Classroom Student Teachers' abilities in mathematical processes (Mathematical Communications, Mathematical Connection, Mathematical Reasoning)?

3. How effective is using the learning stations strategy in developing Elementary Grades Classroom Student Teachers' mindfulness?

In its attempt to seek answers to these research questions, this study is important in raising awareness among educational policy makers, program developers and teachers with regard to teaching mathematics. Moreover, the research will give instructive clues related to faculty members to deal with undergraduate students.

Hypotheses

To answer the questions of the study, certain hypotheses were formulated:

First Hypothesis:

1. There are no statistically significant differences ($\alpha<0.05$) in the abilities of Elementary Grades Classroom Student Teachers in mathematical knowledge which may be attributed to the teaching strategy (Learning Stations, Traditional way).

Second Hypothesis:

2. There are no statistically significant differences ($\alpha<0.05$) in the abilities of Elementary Grades Classroom Student Teachers in mathematical processes that can be attributed to the teaching strategy (Learning Stations, Traditional way).

Third Hypotheses

3. There are no statistically significant differences ($\alpha<0.05$) in the development of mindfulness for Elementary Grades Classroom Student Teachers attributed to the teaching strategy. (Learning Stations, Traditional way).

Research Significance

The significance of the study may be summarised into the following points:

A. Theoretical Significance: This study provides a review of related literature pertaining to three principle modern educational concepts: the strategy of the learning stations, mathematical power, and mindfulness.
B. Applied Significance: This presents a model of application for using the learning stations strategy in mathematics instructions and the characteristics in which the mechanism of this strategy has been demonstrated in a practical and detailed manner, thereby facilitating the use of this strategy for maths teachers.
C. This strategy offers a solution to student's lack of focus and low mindfulness by reducing the use of traditional teaching methods based on memorisation and spoon-feeding.

Terms:

The Learning Stations strategy: the learning station strategy is defined as a teaching method in which teachers present various activities and multiple resources for learning. Student are divided into groups and each group of 4-6 students in a classroom alternate within four learning stations: (Reading Station, Exploratory Station, Visual Station and E-Station) during the learning of geometric concepts.

Mathematical Power: is defined via three dimensions:

1. Mathematical knowledge: the ability of Elementary Grades Classroom Student Teachers in three domains of mathematical knowledge (procedural, conceptual and problem solving) related to geometry. Mathematical knowledge was measured via a test designed specifically for this purpose (Mathematical knowledge test).
2. Mathematical processes: the ability of Elementary Grades Classroom Student Teachers in performing mathematical connection, mathematical communication and mathematical reasoning, related to geometry. This was measured via a test designed specifically for this purpose (Mathematical processes test).
3. Mathematical Content: this includes three units within the course of Geometrical Concepts and their teaching methods, namely: relations between angles (complement, supplementary, corresponding , alternative ,…), two dimensional geometrical shapes (parallelogram, square, rectangle, trapezoid, rhombus, circle and triangle) and three dimensional solids (cube, box, prism, cone and sphere)

Mindfulness: Defined as the abilities of Elementary Grades Classroom Student Teachers regarding the following attributes: actively paying attention and following up, organising ideas, observing current experiences, acting with awareness without passing rapid judgments while studying geometrical concepts. Students' mindfulness was assessed according to the measurement specifically designed for this study.

Limitations:

- Participants were undergraduate students at Al-Zaytoonah University of Jordan who were enrolled in the course entitled "Geometrical Concepts and their teaching methods" for the first semester / 2019-2020.
- Mathematical content was limited to three units of the course namely: relations between angles, two dimensional geometrical shapes and three-dimensional solids.
- The generalisation of findings was determined by the validity and reliability of the measurement tools employed in the study.

Methodology:

Participants: the participants are all students registered in the course "Geometrical Concepts and their teaching methods" during the first semester / 2019-2020 at Al-Zaytoonah University Jordan. The total number of participants was 58 who were distributed into two sections: The first section (Experimental, 30 students) was taught by one of the researchers whereas the other section (Control, 28 students) was taught by another colleague.

Table (1): groups of participants

Group	Number
Experimental	30
Control	28
Total	58

Study Tools: consist of three kinds of tools

1. Knowledge Content: new material was compiled according to the Learning Stations strategy.

2. Two Tests for measuring mathematical power as follows:
   A. Mathematical knowledge test.
   B. Mathematical processes test.

3. Mindfulness scale:

Knowledge Content: the study material consisted of three units from the "Geometrical Concepts and their teaching methods" course, a compulsory course for Elementary Grades Classroom Student Teachers. The units included the following content: relations between angles, two-dimensional geometrical shapes and three-dimensional solids. These topics were chosen on the basis of the importance of geometry in teaching maths, the use of models, shapes, graphs in class, as well as the relevance of such content in real life situations. Consequently, it was viable for researchers to align content with the learning stations strategy. For the development of the content, the researchers made use of previous literature related to the learning stations strategy.

Knowledge Content consists of 18 lectures: (4 relations between angles), (8 two dimensional geometrical shapes), and (6 three-dimensional solids). Since content will be delivered via 18 lectures, researchers designed 4 learning stations for each session. We took into consideration the four learning stations (Reading Station, Exploratory Station, Visual station and E-Station). Accordingly, the total number of learning stations was (18 × 4 =72) learning stations.

Teaching according to learning stations consists of these steps:

- Presenting outcomes.
- Preparation.
- Presenting the concept in a simple way.

International Journal of Innovation, Creativity and Change. www.ijicc.net
Volume 14, Issue 11, 2020

- Distributing applied activities to each station (group).
- Students will engage in meaningful activities in each station.
- Students switch working on stations after each group finishes.
- Assessment and feedback.
- Evaluation and decision-making.
- Rotation

According to this strategy each group has its own tasks and activities. Fig (1) shows the conceptual map which illustrates the stages of the learning stations strategy adopted in this study.

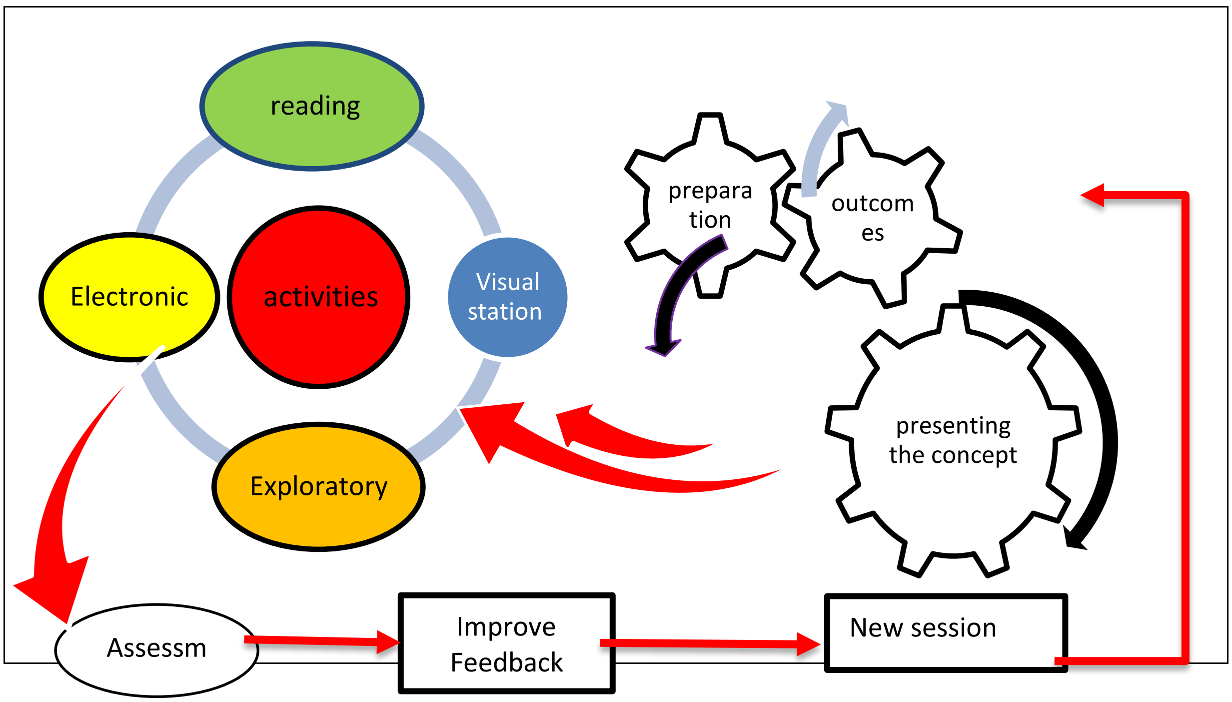

Fig (1): the strategy of learning stations

Fig (1) shows the framework for designing the study content of the three units which depended on the learning outcomes since the outcomes clearly guide all other processes. Moreover, it is a benchmark for conceptual understanding and a way to help students and the tutor to develop practical and applied skills. There was an emphasis on skills, concepts and problems more than on routine mathematical operations.

The learning stations strategy concentrates more on the students' role in learning. It encourages them to play an active role in the learning process through the interaction with one another amidst a rich learning environment. Learning stations present an immense opportunity for students to gain knowledge and thinking skills in one context. Moreover, it provides the means to motivate students towards self-learning.

Mathematical power Measurement Tools:

In order to design the mathematical power measurement tools, the two researchers reviewed many standards and tests that measure mathematical power issued by international institutions, such as the American Foundation for Educational Evaluation and the American National Council of Mathematics Teachers (NCTM, 2000; NAEP, 2003). Also, we benefitted from some previous studies related to this topic, such as the study of Senaidi & Abed (2019), the study of Qbeilat Miqdadi (2014), as well as the study of Al-Khateeb (2017). Accordingly, we designed two tests: one to measure students' mathematical knowledge (mathematical knowledge test) and another to assess students' mathematical processes (Mathematical processes test).

The following is a detailed explanation of each of the two tests:

A. **Mathematical knowledge test**: After referring to several models of tests that measure students' abilities in mathematical knowledge, a test was prepared to measure students' ability in mathematical knowledge, and the test covered the three areas of mathematical knowledge, namely: procedural knowledge, conceptual knowledge, and problem solving, and the test in its initial form consisted of 30 items of multiple choice, and short answer. To verify the validity of the test, it was presented to a group of 5 referees who specialise in mathematics curricula and methods of teaching maths. It was presented to 3 specialists in measurement and evaluation, and amendments were made to some paragraphs, while others were deleted. The referees suggested that the number of test items should be equal to the number of learning outcomes for the educational content. In light of this, the final form of the test consisted of 24 items, and each paragraph centred around a single learning outcome, and the referees were used to build a table of specifications appropriate for the test, where the test items were distributed (24) according to levels of knowledge.

   The three mathematical concepts were considered equal, and the relative weight of each level was approximately 33.3%: 8 items for procedural knowledge, 8 for conceptual knowledge, and 8 for problems. Items were distributed according to the three academic units and the number of learning outcomes for each unit of the study, where the relative weights were as follows: unit of angles (12.5%), unit of geometric shapes (50%), and unit of 3D shapes and solids (37.5%).

Table 2 shows the specification table that was adopted to distribute the test items of the units and the three levels of mathematical knowledge

Table 2: Table of Mathematical Knowledge Test Specifications

Unit	Outcomes	Relative Weight of the Unit	Levels of Mathematical Knowledge			Total
			Procedural 30%	**Conceptual** 40%	**Problems** 30%	100%
Relationship between Angles	3	12.5%	1	1	1	3
2D Geometric Shapes	12	50%	4	4	4	12
3D Shapes	9	37.5%	3	3	3	9
Total	24	100%	8	8	8	24

The test was applied to a pilot sample of 22 students from outside the study sample (from another university). The coefficients of difficulty and discrimination were calculated and found to be ranged between 0.31- 0.72. These factors confirm the quality of the items and their suitability for this study. Also, a split-half method was used to ensure reliability of the test. It was found that the correlation coefficient was 0.76, and the value of the overall factor of the test was 0.86, according to Spearman Brown's equation $w = (2 r) / (1 + r)$ - this confirms that the mathematical knowledge test is characterised as valid and reliable.

B. Mathematical processes test:

The mathematical processes test consists of 24 items that covers students' abilities in three domains (communication; connection; and reasoning). It should be duly noted that the researchers followed the same procedures of the previous test with 8 items per domain.

Table (3): Table of Mathematical Knowledge Test Specifications

Unit	Outcomes	Relative Weight of the Unit	Domains of mathematical processes			Total
			communication 30%	**Connection** 40%	**reasoning** 30%	100 %
Relationship between Angles	3	12.5%	1	1	1	3
2D Geometric Shapes	12	50%	4	4	4	12
3D Shapes	9	37.5%	3	3	3	9
Total	24	100%	8	8	8	24

The difficulty and discrimination coefficients were calculated and found to be between 0.29 - 0.71 according to a pilot sample, while the correlation coefficient between the two halves was 0.73, and the value of the overall factor of the test was 0.84. These indicators were considered to be appropriate for this study.

Mindfulness scale: this scale was adopted from Bergomi , Tschacher & Kupper (2013) and some studies that dealt with alertness and self-efficacy in mathematics (Leland ,2015; Shenck , 2011 ;Kevdere, 2014, and Najwany, 2019).

The scale consisted of four domains: conscious judgment; accuracy of observation; logical description and reflection. These domains were considered to be the most appropriate for classroom student teachers. At the same time these domains are essential for students' success in learning mathematics.

The last version of the scale consisted of 20 items and was equally distributed into the previous four domains. Validity and reliability were tested following the same steps as in the previous tests.

Mindfulness scale is a Likert's-five scale. To ensure reliability the scale was tested by split-half method and it was found that the correlation coefficient was 0.79, and the value of the overall factor of the test was 0.88.

Procedures

The first step was to test the equivalence of groups. Table 4 shows the results of the t test for independent samples.

Table 4: t test for independent samples

Tool	**Group**	#	Mean	SD	T	Sig
Mathematical Knowledge test	Experimental	30	**11.23**	**2.65**	**0.3449**	**0.7314**
	Control	28	**10.98**	**2.87**		
Mathematical Knowledge Test	Experimental	30	**9.78**	**1.89**	**0.5533**	**0.4300**
	Control	28	**10.21**	**2.74**		
Mindfulness scale	Experimental	30	**51.67**	**4.32**	**0.6922**	**0.4916**
	Control	28	**50.11**	**5.13**		

It is clear from table 4 that there are no significant differences between the experimental and control groups which means they are equivalent.

Results and Discussion:

1. To justify the first hypothesis: There are no statistically significant differences ($\alpha<0.05$) in the abilities of Elementary Grades Classroom Student Teachers in mathematical knowledge which is attributed to the teaching strategy (Learning Stations, Traditional way). A test for the independent samples was used. Table 5 illustrates these results.

Table 5: Results of the t test to identify the differences between the experimental and control groups in the mathematical knowledge test.

Domain	Group	#	Mean	SD	T	Sig	Eta Square
Procedural Knowledge	Experimental	30	6.48	1.45	3.7814	0.0004	0.203
	Control	28	5.10	1.32			
Conceptual Knowledge	Experimental	30	6.79	1.56	4.6293	0.0001	0.2766
	Control	28	4.95	1.46			
Problem Solving	Experimental	30	5.51	1.54	3.837	0.0003	0.2081
	Control	28	3.81	1.83			
Total	Experimental	30	18.69	3.21	6.034	0.0001	0.3939
	Control	28	13.86	2.86			

Table 5 shows that there are statistically significant differences ($\alpha<0.05$) in the abilities of elementary grades classroom student teachers in mathematical knowledge attributed to the teaching strategy for every domain and overall. Moreover, Eta values indicate that the size of the impact of the learning stations strategy in developing students' abilities in mathematical knowledge is greater than 0.14 and according to Cohen such a value indicates that the impact size is large.

This result can be explained by the fact that the learning stations strategy provided students with educational and applied experiences in every field of mathematical knowledge. Therefore, students in the various stations solved multiple mathematical tasks and activities, some of which focused on developing students' abilities to perform mathematical operations while other tasks revolved around linking geometry concepts with each other in order to develop students 'conceptual knowledge; moreover, the bulk of mathematical activities focused on solving problems. Perhaps this method developed students' mathematical knowledge and was a reason why the experimental group obtained an average higher than the average of the control group on the mathematical knowledge test. This result is consistent with the results of many previous studies that have reached the effectiveness of the learning stations strategy in achieving the conceptual development of students (Zaydan, 2019 ; Khaji & Rasheed , 2016 ; Bulunuz & Jarrett, 2010).

The effectiveness of the learning stations strategy in developing mathematical knowledge can be explained by the fact that this strategy provided students with multiple educational resources and various activities that aroused students' enthusiasm for the learning process and made them build their knowledge and mathematical ideas by relying on themselves during their interaction with their peers as they worked on mathematical tasks in various learning stations.

It is clear that learning stations rely on the constructivist approach as it emphasises that the process of learning mathematics requires an active role for students. Accordingly, students are able to take responsibility for their own learning instead of passively listening to the teacher and imitating him / her by performing routine mathematical operations and memorising mathematical rules. Such findings are consistent with Kusmaryono, & Suyitno (2015).

The results of the study may also be attributed to the fact that the learning stations allowed students to use all their senses while engaging in the educational activities that included: performing activities by manipulatives, constructing and drawing geometric shapes, using verbal expressions, investigating mathematical ideas ... etc.. All these experiences increased students' abilities to connect and integrate conceptual knowledge with procedural knowledge, as the students solved geometrical mathematical problems consistent with Al-Nemrawi's (2016) conclusion that teaching mathematics through multiple representations and various methods increased students' flexibility in using elements of mathematical knowledge, thus enabling them to connect and integrate conceptual knowledge with procedural knowledge.

The higher achievements of the experimental group students may be due to the teacher's role according to the learning stations strategy, as he /she has a different role from the traditional role. Teachers using learning stations shift between the learning stations and interacting with their students, monitoring them and following up on their achievements and solutions, thereby providing the students with support and assistance, while performing multiple evaluation processes. As students are busy with sports' tasks, the teacher analyses and explains the effectiveness of educational experiences and makes decisions that aim to improve and develop the learning and teaching processes. Consequently, such a strategy continues the process of developing and improving the teaching periodically.

Accordingly, the learning stations strategy encourages the teacher to become a diligent researcher who has convictions towards change and improvement. Such a teacher keeps up with global trends in a manner consistent with what was stated in the National Council of Mathematics Teachers document (NCTM, 2010) as well as Al-Nemrawi's (2020) assertion that mathematics teachers need to reflect on their educational practices and have convictions for change and improvement since such matters compose the core of any professional development programs for mathematics teachers.

2. To justify the second hypothesis: there are no statistically significant differences ($\alpha<0.05$) in the abilities of elementary grades classroom student teachers in mathematical processes attributed to the teaching strategy (Learning Stations, Traditional way). A t Test for independent samples was used. Table 6 illustrates these results.

Table 6: The results of the t test to identify the differences between the experimental and control groups in the mathematical processes test.

Domain	**Group**	#	**Mean**	**SD**	**T**	**Sig**	Eta Square
communication	Experimental	30	5.98	1.65	3.3781	0.0013	0.2117
	Control	28	4.61	1.42			
connection	Experimental	30	6.59	1.72	4.4613	0.0001	0.2622
	Control	28	4.75	1.39			
reasoning	Experimental	30	4.97	1.27	3.1516	0.0026	0.1506
	Control	28	3.72	1.73			
the whole test	Experimental	30	17.54	2.71	5.927	0.0001	0.3854
	Control	28	13.08	3.03			

Table 6 shows that there are statistically significant differences ($\alpha<0.05$) in the abilities of elementary grades classroom student teachers in mathematical processes attributed to the teaching strategy for every domain and overall. Moreover, Eta values indicate that the size of the impact of the learning stations strategy in developing students' abilities in mathematical processes is greater than 0.14 and according to Cohen such a value indicates that the impact size is large.

The higher achievements of students who studied according to the strategy of learning stations in testing mathematical processes as a whole and in each of its fields may be attributed to the educational material used in the learning stations strategy since such material focuses on developing the students' ability to perform practical tasks. Such tasks provide real opportunities for students to learn by solving mathematical problems related to their daily life, since students actively read problems, understand what is required, make assumptions and find solutions.

The above-mentioned activities employed in the learning stations strategy required the exchange of ideas amongst students within each group as well as within the whole class, thereby increasing the students' abilities in the three mathematical processes (communication, connection, and reasoning). In contrast, such engaging educational experiences were not available for the control group students who studied according to the traditional method, relying on educational material centred on behavioural goals. Such material mainly focuses on students' abilities to remember and memorise mathematical rules and mathematical procedures (Nemrawi, 2014 ; Senaidi & Abed, 2019; Qbeilat & Miqdadi, 2014)

The discrepancy between the achievements of the two groups may also be due to the fact that the learning stations strategy provided a safe and stimulating learning environment for engaging in dialogue and gaining an understanding of mathematical concepts. Students moved freely within the learning stations and such movement provided them with new educational situations and experiences that increased their self-confidence which, in turn, generated questions and inquiries. Students presented their solutions using logical evidence while assessing mathematical ideas. Perhaps such mind-stimulating activities contributed to the development of students' abilities in the three mathematical processes. Accordingly, this aspect of the learning stations concurs with social constructivism as well as the theory of multiple intelligences both of which called for presenting mathematical ideas (issues) as social humane issues that require active dialogue and negotiation (Nemrawi, 2020; Gupta, 2008; Bulunuz and Jarrett, 2010).

It can also be noted that the variety of learning stations developed the experimental group's skills in mathematical processes. In the Visual station students were busy reading and understanding drawings and translating these drawings into symbolic formulas. Such enhancement of students' abilities is consistent with Al-Nemrawi's (2016) conclusion that the multiple representations of mathematical concepts improve students' ability to communicate mathematically and develop their abilities in solving mathematical problems.

In addition, the "exploratory station" contained mathematical activities that required students to connect geometric shapes with each other and reveal the relationships amongst them. Here students proposed their hypotheses then interpreted and justified them, relying on logical arguments and this type of thinking developed students' abilities in the processes of linking and inference consistent with Abu Sakran's (2017) findings that mathematical reasoning is one of the higher levels of thinking and this level requires varied and intense experiences and training for students to achieve it. Perhaps the learning stations strategy provided valuable educational situations that contributed to the development of the experimental group in the field of linking and reasoning.
It can also be noted that the "E- station" was valuable for students in performing lengthy arithmetic operations, and time was used to solve important and valuable problems related to students' daily life.

According to the preceding argument, it may be concluded that the students' rotation within the learning stations provided them with great educational experiences all of which resulted in the higher achievements of the experimental group in comparison to the control group in the areas of mathematical operations as a whole as well as in each of its areas (communication, connection, reasoning).

3. To justify the third hypothesis: There are no statistically significant differences ($\alpha<0.05$) in the development of the mindfulness for elementary grades classroom student teachers attributed to the teaching strategy. (Learning Stations, Traditional way). A t test for independent samples was used.

Table 7: The results of the t test for the significance of the difference between the mean of the two groups on the post application of mindfulness scale.

Group	#	Mean	Standard Deviation	t	sig	Eta Square
Experimental	30	76.54	4.66	15.8805	0.0001	0.8182
Control	28	54.66	5.78			

Table 7 shows that there are statistically significant differences ($\alpha<0.05$) in the abilities of elementary grades classroom student teachers in the mindfulness scale attributed to the teaching strategy. Moreover, Eta value indicates that the size of the impact of the learning stations strategy in developing students' abilities within the mindfulness scale is greater than 0.14 and according to Cohen such a value indicates that the impact size is large.

This result can be attributed to the following:

1. Students of the experimental group studied the educational material according to the strategy of learning stations, and this strategy provided them with new experiences and educational situations, thereby creating an exciting educational setting for them. This new experience aroused their curiosity for learning, and increased their attention which helped them issue judgments more cautiously, and to act consciously during their preoccupation with observing and tracking geometric concepts in a manner consistent with Ghasem & Soleymani , 2016; Nemrawi, 2014, who concluded that exciting situations and experiences develop students' awareness and active participation in the learning process.

2. The reason may be related to the two previous questions, where the results revealed the experimental group's higher achievements compared to the control group in the two tests of mathematical power. This may explain why the experimental group excelled in the 'mindfulness scale', as many studies confirmed that outstanding success and achievement raises students' motivation to learn, develops their love of exploration and inquiry, and increases their desire to learn. Repeated success enhances their self-confidence and drives them to more effort and perseverance (Omar, 2019).

3. This result can be attributed to the principles on which it is based. The learning stations strategy puts the students at the center of the learning process, and considers them responsible for their learning, independent in their thinking, and able to make decisions, all of which contributed to increasing the students' mindfulness. Such results are in accordance with Senaidi & Abed (2019) who referred to the student-centered learning process which stimulated students' curiosity and the ability to overcome difficulties, thus actively learning mathematics.

4. The reason may be due to the use of collaborative work (working in small groups) during students' participation in sports activities within each of the learning stations. The learning stations also provided students with the opportunity to describe their educational experiences, and to ask questions and make inquiries with their colleagues which increased their mindfulness. Such findings are consistent with Schenck's (2011) study that it is possible to develop the mindfulness of individuals by encouraging them to describe the experiences they go through.

Recommendations

In light of the preceding results this study recommends the following:

1. Training classroom student teachers and university instructors to utilise the learning stations strategy in their classes since such a teaching method develops both learning and teaching at the school and university levels.
2. Raising mathematical teachers' awareness regarding the significance of mindfulness in developing students' learning of mathematics.
3. Focusing on mathematical power as a standard for assessing students' learning of mathematics.

REFERENCES

Abu Sakran, M. (2017). Effectiveness of proposed program based on mathematical power in developing achievement, divergent thinking and mathematical communication among tenth grade students. Unpublished Doctoral Dissertation. Ain Shams University, Egypt.

Al-Khateeb, M. (2017). The effect of an educational program based on mathematical power in the development of algebraic thinking and solving Algebraic problems among second intermediate grade in AlMadinah Al-Munawara. Journal of Psychological and Educational Sciences, 8(2), 404-434.

Bergomi, C., Tschacher, W., & Kupper, Z. (2013). Measuring mindfulness: First steps towards the development of a comprehensive mindfulness scale. *Mindfulness*, 4(1), 18 - 32.

Bulunuz, N., & Jarrett, O. (2010). The effects of hands-on learning stations on American elementary teachers' understanding about earth and space science concepts. *Eurasia Journal of Mathematics, Science & Technology Education*, 6(2), 85- 99.

Ediger. M. (2011). Learning stations in the social studies. College Student Journal, 45(1),47 -50.

Fisher, R. (2006). Still thinking: The case for meditation with children. *Thinking Skills and Creativity*. 1(2), 146- 151.

Gercek, C., & Ozcan, O .(2016). Determining the students views towards the learning stations developed for the environmental education . Problems of Education in the 21St Century, 69(1), 29 – 36.

Ghasem, R., & Soleymani, B. (2016). Relation between math self- efficacy and mathematics achievement with control of math attitude. *Applied Mathematics*, 6(1), 16 – 20.

Gupta, A. (2008). Constructivism and peer collaboration in elementary mathematics. *Education. Eurasia Journal of Mathematics, Science and Technology Education*, *4* (4), 381- 388.

Hassan, W. (2013). The effectiveness of scientific station strategy in solving mathematical problems and tendency towards the material for female pupils at 5th grade in elementary school. Unpublished Master Dissertation. Al- Mustansiriyah University, Iraq.

Jones,D. (2007). The station approach: How to teach with limited resources. *Science Scope*. 30(6), 16 -21.

Kevder, L. (2014) . Mathematics self- efficacy self – concept and anxiety among 9th grade students in Lativa. Procedia- Social and Behavioral Sciences, 116, 2687- 2690.

Khaji,T., & Rasheed,M.(2016).The effect of scientific station and Wheatley strategies on the achievement of fourth intermediate students in mathematics and improving inclinations towards it. *ASEP*, 72(1), 359- 376.

Kusmaryono, I. , & Suyitno, H. (2015). Mathematical power's description of students in grade 4th based on the theory of constructivism. *International Journal of Education and Research,* 3(2), 299-310.

Leland,,M.(2015). Mindfulness and students' success. *Journal of Adult Education*, 44(1)19 -24.

Najwany, N. (2019).Mindfulness among the post- basic education in light of some variables in the governorate Muscat. *Journal of Educational and Psychological* Studies, 13(2), 220- 234.

National Assessment of Education Progress (NAEP) (2003). *Mathematics Framework for the 2000, and 2003 National Assessment of Educational Progress*. DC: National Assessment Governing Board.

NCTM (2000). Principle and standards for school mathematics. Reston, VA: NCTM.

Nemrawi, Z. (2014). The effect of multiple intelligences theory-based strategy on classroom education students in the attainment of mathematical concepts and development of their beliefs about learning mathematics. *Mu'tah Humanities and Social Sciences Series*, 29(1), 79 – 110.

----. (2020). The efficiency of profession development programs based on social constructivism in improving teaching practices of mathematics teachers in Jordan. *Journal Educational and Psychological Studies, 14(2), 342 – 361.*

Omar, A. (2018). Effectiveness of Teaching Biology Course Using Learning Stations Strategy in Developing the mindfulness and Conceptual Understanding of First Grade Secondary School Students. *Journal Educational and Psychological* Studies**,** 12(2), 226 – 244.

Pujiastuti, H., & Rafianti, I. (2017). Analysis of students' mathematical power in terms of Stifin test*. Journal of mathematical education, 6 (1), 2 9 – 36.*

Qubeilat, M., & Migdady, A.(2014).The impact of teaching according to mathematical power on the conceptual understanding of girl students in eighth grade in Jordan*. Dirasat Educational Sciences*, 41(1), 333- 346.

Senaidi, S., & Abed, A. (2019).The effect of using a teaching program based on mathematical power on acquisition of mathematical concepts for 8th grade students in light of their mathematical self- efficacy. *Jordan Journal of Educational sciences*, 15(2), 233- 249.

Shenck, L. (2011). *How to develop mindfulness*. http://www.mindfulnessmuse.com/mindfulness-exercises/how-to-develop-mindfulness.

Zaydan, H. (2019).The effect of using scientific station strategy on acquisition of geometric concepts and attitudes towards geometry of seventh grade students. Unpublished Master Dissertation. Al-Bayt University, Jordan.