International Journal of Applied Mathematics
& Statistical Sciences (IJAMSS)
ISSN(P): 2319-3972; ISSN(E): 2319-3980
Vol. 7, Issue 4, Jun - Jul 2018; 79-96

International Academy of Science, Engineering and Technology
Connecting Researchers; Nurturing Innovations

THE IMPACT OF EMPLOYING THE FLIPPED LEARNING STRATEGY ON THE DEVELOPMENT OF SOME CREATIVE TEACHING SKILLS AMONG TEACHER STUDENTS OF MATHEMATICS AT AL AQSA UNIVERSITY

Abdel Kareem Mousa Farajullah

Professor, Curriculum and Mathematics Teaching Methods, Lecturer, Department of Basic Education, Faculty of Education - Al-Aqsa University, Gaza, Palestine

ABSTRACT

This study aimed to investigate the impact of employing flipped learning strategy on the development of some creative teaching skills among teacher students of Mathematics in Al Aqsa University. To achieve the objectives of the study, the researcher used the quasi-experimental design, in which the study tool was a test for creative teaching skills and a note card, applied to a sample of 82 teacher students specialized in Mathematics in Al Aqsa University, distributed into two groups (experimental and control group), in which the experimental group, which was taught using the Flipped Learning strategy, consisted of (42) students, while the control group, which studies using the traditional way, consisted (40) students.

The study results showed that there were significant statistical differences between the mean grades of the students of the experimental and control groups in the post application of the test of creative teaching skills and the note card, where the value of T reached (7.888) and (23.114), respectively, in favor of the experimental group students at the level of significance (0.01); the size of the impact was big reaching (1.76) and (5.16), respectively.

The study recommended the need for training and encouraging of universities' faculty members on the employment of the flipped learning strategy in their educational lectures.

KEYWORDS: Flipped Leaning Strategy, Creative Teaching Skills

Article History

Received: *Jul 14, 2018* **|** ***Revised:*** *Jul 05, 2018* **|** ***Accepted:*** *Jul 11, 2018*

INTRODUCTION

The era in which we live is characterized by rapid changes, successive developments, a tremendous explosion of knowledge, and a rapid technological development in all areas of life. Therefore, students' creative abilities must be addressed so that they can face the contemporary and future problems resulting from these changes, facing them with new and innovative solutions, enabling them to cope with such changes.

Despite the importance of the good curriculum, the attractive book, and the typical building, all these and other things are of not as importance as the presence of a competent and distinguished teacher, who is sincere to his work and capable of his course (Al Warthan, 2007: 10). Whatever the quality of the curriculum and the available possibilities,

laboratories, and tools, it does not achieve the desired benefit without the presence of a teacher who is creative in his personality traits and in his professional, cultural and scientific composition and in his possession of various educational competencies that enable him to perform his multiple roles of planning, performance and evaluation (Ibrahim, 2005: 220). Teachers are the creators of thinking and are the soul and primary and most important element of the educational process, in which the teacher's job is no longer restricted to providing students with information and facts as they were in the past, but has rather become a comprehensive educational process for all aspects of students' development. The teacher must be able to deal with students honestly and faithfully and to be able to direct their energies towards innovation and creativity so that the educational process is effective and achieves its desired goals. (Shadifat, 2010: 4).

The development of creativity and creative thinking is one of the most important educational goals in practical education and in teaching as well, as specialists in practical education consider that training students on the different levels of education and creative thinking skills and development of their creative tendencies as one of the basic purposes in teaching (Najjar, 2012: 149).

Mathematics courses are an important mean for developing creativity with all its skills, where creativity is not done in a vacuum, but must be preceded by a problem that challenges the mind. Therefore, mathematics is a fertile field for the development of creativity because of its structural nature and its evidentiary structure and its richness in attitudes that can be directed to students to find various solutions for different situations, in which its study makes the student used to objective criticism of the situation, all of which allows the student to gain some of the basic abilities of the creative process (Al-Sa'idi, 2007: 132).

Although mathematics is considered to be a fertile medium for the development of students' creativity, it is still linked to the availability of a set of teaching practices among mathematics teachers, which is called creative teaching (Abdullah, 2001: 6).

Creative teaching is based on the full use of available educational resources and guidance in line with the potentials, predisposition, and abilities of students in order to reach the degree of mastery in the least possible time and cost, and is based on directing students towards coping with contemporary and future global changes and developments (Ibrahim, 2005: 221). Creativity in teaching or creative teaching can be achieved by the characterizing of teaching behavior by innovative features (fluency, flexibility and originality) and is achieved when the teacher employs as many appropriate educational ideas as possible, along with diversification of ideas and educational responses, and the modification and organization of educational situations appropriately and the production of new and non-repetitive educational ideas and responses.

There are many strategies that contribute to creative teaching; one of these strategies is the flipped learning strategy, which is the currently popular idea advocated by educators. Bill Gates sees this kind of education as an example of a promising educational innovation (Zein, 2015: 173).

Bergmann & Sams (2014: 15), Francl (2014: 122) and Keengwe (2014: 12-15) all clarify that the idea of flipped learning is based on the transformation of the learning process from the educational institutions to students' houses, where students receive the new concepts at home through content prepared by the teacher in the form of videos, presentations or other learning materials. Metwalli (2015:91) says that flipped learning seeks to change the traditional role of the school and home as to replace each other. Hence, the flipped learning has derived its name.

In traditional learning, the teacher explains the teaching material during the class, while students return home to do their homework and deal with problems alone, which can lead to frustration at not being able to overcome problems at times; while in flipped learning, the student will follow up the videos prepared by the teacher outside the classroom and then come to the school for application, discussion and problem solving with the help of the teacher and other students. (Roach, 2014: 75)

Flipped learning is one of the modern technology solutions which addresses the weakness of traditional education, where (Hamela, 2014: 69) (Vaughan 2014: 37) and (Mcdonald & Smith, 2013: 40) agree that Flipped Learning makes the teacher able to engage more deeply with students by spending more time interacting, communicating, and discussing with students away from the traditional classroom atmosphere, thereby contributing to making them more interactive. Moreover, Flipped learning has a number of advantages for both the teacher and the student, of which the most important is the flexible use of technology, consideration of students' individual differences due to the ability of re-watching video clip and taking notes, re-use and update of educational sources, transformation of students to information seekers, as well as increasing the efficiency of the teacher in evaluating the understanding of each student and providing data and statistics for the level of students' performance, which helps in providing opportunities to overcome the gaps between students' understanding.

A number of previous studies have pointed to the low level of creative teaching among mathematics teachers such as study of (Al-Nimr, 2014), (Abu Sitta, 2011) and (Abu Al-Ela, 2009), as confirmed by the survey conducted by the researcher on 12 teacher students of Mathematics during the period of field training at Al-Aqsa University through the application of a note card which showed a low level of creative teaching.

In light of the foregoing, there is an urgent need to conduct such study aiming to answer the following main question:

What is the impact of employing the Flipped Learning Strategy on the development of some creative teaching skills among Mathematics' Teacher students of in Al Aqsa University.

To Answer this Question, the following Sub-questions have to be Answered

- What should creative teaching skills be available to teach students of mathematics in Al-Aqsa University?
- What is the impact of employing the flipped learning strategy in developing some creative teaching skills among teacher students of the mathematics of Al-Aqsa University?
- What is the impact of employing the flipped learning strategy on the performance of creative teaching skills among teacher students of Mathematics of Al-Aqsa University?

Study Hypotheses

The Study Aims to Verify the Validity of the following Hypothesis

- There are no significant statistical differences ($\alpha \leq 0.05$) between the mean scores of the experimental group students and their peers in the control group in the cognitive post-test.
- There are no significant statistical differences ($\alpha \leq 0.05$) between the mean scores of the experimental group students and their peers in the control group in the performance posttest (note card).

Objectives of the Study

The present study aims to determine the impact of employing the Flipped Learning Strategy on the development of some creative teaching skills among Teacher students of Mathematics in Al Aqsa University.

Significance of the Study

The Study is Expected to Contribute to the following

Directing the attention of those responsible for planning the teacher preparation and training programs towards the following points:

- The need to be able to master the skills of creative teaching as one of the most important outputs of education required in the programs of preparing mathematics teachers.
- Flipped Learning is a new educational teaching strategy that can be used to train future teachers before and during service.
- This research may help teacher students to trust themselves and accept others' criticism, as well as training them on how to evaluate themselves and their peers objectively.
- Mathematics supervisors may benefit from the note card prepared in this paper in evaluating the creative performance of mathematics teachers.
- The current study may open new horizons for researchers in the field of teaching mathematics to conduct future studies in the use of new strategies in the educational process at the university level.

OPERATIONAL DEFINITIONS OF THE STUDY

Flipped Learning Strategy: A strategy in which the teaching process is reversed through which information is presented to the students at home through pre-recorded lectures. The lecture time is allocated for the application of activities under the teacher's supervision.

Creative Teaching Skills: A group of behaviors that the teacher possesses and is able to practice accurately, proficiently, quickly and with less effort and costs, either during planning, implementation or assessment stage of teaching mathematics in a manner characterized by fluency, flexibility, and originality. It is measured by the total grades obtained by the teacher of mathematics in the cognitive test and note card.

Limitations of the Study: This study is limited to the following:

- **Objective Limit**: The study was limited to determine the impact of employing the flipped learning strategy on the development of some creative teaching skills (creative planning, creative implementing, and creative assessment of lessons) among teacher students of the mathematics of Al-Aqsa University.
- **Spatial Limit:** Al-Aqsa University in the Gaza Strip - Palestine
- **Time Limit:** Second semester of the academic year 2016-2017
- **Human Limit:** a random sample of Mathematics' teacher students of Al-Aqsa University.

PREVIOUS STUDIES

The present study referred to other relevant Arab and foreign studies to benefit from; these studies can be displayed in two axes, *studies related to Flipped Learning, and studies related to Creative Teaching Skills*, where those studies are to be presented in descending order according to its date of application or publication:

First Axis: Studies related to Flipped Learning Strategy

Abu Jelbah (2016): A study which aimed at revealing the effectiveness of the Flipped classroom strategy using the Edmodo site on the development of creative thinking and the trend toward biology among tenth-grade students in Riyadh city. The study followed the semi-experimental approach that is based on the design of the two equal groups (the experimental and control groups), each consisting of 58 female students. The study tools were the test for creative thinking and a trend scale. The study reached a group of results, of which the most prominent is that there are significant differences between the experimental and the control group in the post-measurement in favor of the experimental group.

Juhary (2015): This study aimed to identify the students' tendencies towards the use of the Flipped classroom at UNUM Malaysian University. The study used the descriptive analytical approach, in which the study sample consisted of 40 students from two different disciplines (Air Technology and Medicine). The study reached a series of results, most notably is that the Flipped classroom can be a useful concept in promoting teaching and learning.

Arcos (2014): a study that aimed at determining the perceptions of public education teachers who implement the Flipped learning system through open educational resources on the performance of learners in some US schools. The study adopted the descriptive analytical approach, with a study sample consisting of (300) teachers, and with a questionnaire as the study tool used. The study reached a number of results, of which the most important is the teachers' satisfaction with the use of Flipped Learning.

Rozinah (2014): This study aimed at using the flipped classrooms to enhance students' participation and promote active education at the Malaysian University of Science. The study used the descriptive analytical approach, in which the study sample consisted of (24) students and the study tool was a questionnaire. The most important finding of the study is the effectiveness of the use of flipped classrooms and its impact on self-learning.

Johnson (2013): A study that aimed to observe students' attitudes toward flipped learning, adopting the descriptive analytical approach and a study sample of (72) students, with the questionnaire as a study tool. The study concluded that all the students were enjoying the flipped learning experience.

Chipps, 2013: A study that aimed to identify the effectiveness of the flipped classrooms on students' academic achievement and tendencies towards learning mathematics and solving problems. The study followed the experimental approach that is based on two unequal groups (The experimental and control group), in which the experimental group consisted of (33) students, while the control group consisted of (39) students. The study tools were an achievement test and a trending scale. The study reached a number of results, of which the most important was that there were significant statistical differences between the two study groups in the achievement posttest and the trending post scale in favor of the experimental group.

Marlowe (2012): This study aimed at revealing the effect of the flipped classrooms on increasing students' achievement and stress levels. The study followed the semi-experimental approach, with a sample of (19) students from the

D American Academy of the United Arab Emirates, of which the study tool, the questionnaire, has been applied on. The results indicated that the levels of stress among students are less in this type of classroom environment compared to other types of classes, introducing positive feelings towards the flipped classrooms.

Strayer (2007): A study that aimed to investigate the effect of the flipped classrooms on teaching calculus at Ohio State University by comparing active learning in both the traditional classrooms and flipped classrooms. The study followed the quasi-experimental approach based on two unequal groups, of which the experimental groups consisted of (23) students, while the control group consisted of (27) students; the data was collected through observations and interviews. The most important results of this study are students' satisfaction with the educational process, and the retention of students' who studied using the flipped classrooms of the mathematical concepts more than other students.

Second Axis: Studies related to Creative Teaching Skills

Al-Nimr (2014): A study that aimed at determining the extent to which mathematics teachers of the primary stage in Saudi Arabia possess creative teaching skills. This study followed the descriptive analytical approach, with a study sample of (25) teachers of mathematics in the primary stage in Al-Majma'a Governorate. Study result showed that teacher's possession's levels of creative teaching skills vary in degrees ranging from low to medium.

Al-Najjar (2012): This study aimed to determine the extent to which teacher students of science possess the skills of creative teaching in the College of Teaching in Al Qunfudah and its relation to their academic achievement. The study sample consisted of (22) teacher students, and the study results showed the weakness of creative teaching skills among teacher students and has also indicated that there is no relationship between academic achievement of students and their creative teaching skills.

Chang & Chung & Bennington (2011): This study that focused on surveying and examining studies that dealt with creative teaching skills practiced by teachers in Taiwan. The study results showed that there was a relationship between creative teaching and personal characteristics of learners, and between creative teaching and the development of internal motivation among learners.

Abu Sitta (2011): This study aimed at revealing the effectiveness of a training program on the development of creative teaching skills and reducing of the anxiety of teaching among the students of the Faculty of Education. The study sample consisted of 42 students specialized in Mathematics, and the study tools was a note card for the teaching performance of creativity and a scale of teaching anxiety. The results indicated the effectiveness of the training program on the development of creative teaching skills and reducing the teaching anxiety among the sample members.

Abu El-Ela (2009): A study that aimed at revealing the effectiveness of a training program proposed to develop creative teaching skills and strategies for the female teacher students. The study used the design of one group, with a study sample of 12 students, and the achievement test as the study tool. The study reached a series of results, of which the most important is the existence of significant statistical differences in the scores of the study group in the achievement pre and posttest, and the note card in favor of the post-application.

Miyagoshi, Shibata & Tajima (2007): A study aiming at integrating teachers at Toyama University in Japan into a program consisting of creative courses for the purpose of developing their creative teaching skills and encouraging their students to be imaginative and creative. The study revealed the effectiveness of the program in terms of enabling the teacher to provide tips and instructions for students while teaching, and enabling students to ask questions to teachers.

General Comment on Previous Studies: Through the presentation of previous studies, the following points can be illustrated:

- Flipped learning strategy, as a teaching entry based on scientific principles, can be used in different educational stages and in teaching different courses.
- Flipped learning strategy has a positive and effective impact on improving the teaching and learning process.
- The availability of creative teaching skills among mathematics teachers is very essential.
- The current study benefited from previous studies in formulating the problem of the study, consolidating its theoretical framework, preparing its tools, and implementing the Flipped learning strategy.
- The present study is distinguished from other previous studies in that it is the first study within the limits of the knowledge of the researcher on the Palestinian environment in the use of the Flipped learning strategy to develop creative teaching skills for teacher students of mathematics at Al-Aqsa University.

THE STUDY METHODOLOGY AND PROCEDURES

First: Study Methodology

The researcher used the quasi-experimental approach that is based on two random groups (experimental and control group), by using the experimental design of the pre and post-test for two equal groups.

Second: Study Population

Based on the statistics of the Admission and Registration Department at Al-Aqsa University, the study population consisted of all Mathematics' Teacher students in Al Aqsa University registered in the course of Methods of Teaching Mathematics, totaling (282) students, of which (90) are males and (192) are female students, during the second semester for the academic year (2016 - 2017).

Third: Study Sample

The study sample consisted of two equal study groups chosen in a targeted way from all study groups from Al Aqsa University, in which the experimental group consisted of (42) students, while the control groups consisted (40) students.

Fourth: Study Tools

- **Note Card**

To achieve the purpose of the study, which is to determine the impact of employing the Flipped Learning Strategy on the development of some creative teaching skills among Mathematics' Teacher students of Al Aqsa University, the note card has been used as a study tool, which consisted in its final form of (62) paragraphs, distributed into three dimensions (skills of Creative lesson planning, creative lesson implementation, and creative lesson assessment). To make the note card in its final form, the following steps have been used:

- **Identifying the Purpose of the Note Card:** the note card aims to measure the performance in creative teaching skills of teacher students of mathematics at Al-Aqsa University.
- **Identifying the Dimensions of the Note Card:** There are three dimensions of the note card (creative lesson planning skills, creative lesson implementation skills, creative lesson assessment skills).

- **Phrasing the Paragraphs of the Note Card:** The paragraphs of the note card were phrased in a procedural form, in which the number of paragraphs in the initial form was (64) paragraphs distributed on the three dimensions.
- **Measurement Scale and Grading:** Remarks were added according to the Likert scale, which is the approval of the performance degree (very large and has five degrees, large and four degrees, medium and has three degrees, low and has two degrees, and very low with one degree).
- **Validity of the Note Card:** The validity of the note card was tested in the following way:

Arbitrator Validity: The note card was presented to a group of arbitrators who are specialized in education, curricula and teaching methods in the Palestinian universities, to guide their opinions on the adequacy of the paragraphs of the note card for the study purpose, as well as to verify the accuracy and clarity of the language. Suggested modifications were taken into consideration, in which some skills have been omitted, added, replaced and modified, the final form of the note card consisted (62) paragraphs.

Note Card Validity: the note card was validated by applying the note card to a sample of 12 students outside the study sample, and then using the stability of the observed students by calculating the agreement coefficient between the scores of the first student and second student observed using Cooper equation, in which the agreement coefficient has reached (0.854), indicating that the note card has a high degree of validity, and thus is ready for application.

The test of creative teaching skills, which has been prepared based on the following steps:

- **Identifying the Purpose of the Test:** the test aims to measure the knowledge of teaching students of the mathematics of the terms related to creative teaching skills.
- **Identifying Mathematical Skills*:*** The researcher went through literary works and previous studies discussing the issue of creative teaching skills. He also surveyed the opinions of a sample of specialists in education through personal interviews (Delphi method), where the researcher proposed a list of creative teaching skills needed for teacher students of mathematics in Al Aqsa University, consisting of (62) skills, categorized under three main skills as follows: creative teaching planning (21), creative teaching implementation (21), and creative teaching assessment (20).
- **The Initial Form of the Test:** The initial form of the test consisted of (64) multiple choice questions, each with four choices.
- **Exploratory Experimentation of the Test:** After the preparation of the initial test, it was applied on an exploratory sample of (40) students outside the study sample, for the purpose of calculating the difficulty and discrimination indexes of the test paragraphs, testing the validity and reliability of the test, and determining how long it takes to answer the test when applied to the basic study sample.
- **Test Grading*:*** test was graded after the sample answered its questions, in which the scores were identified by giving one grade for each multiple choice question, in which that the grades were restricted between zero and 60.
- **Analysis of the Paragraphs of the Test*:*** The results of students' answers on the test of creative teaching skills were analyzed in order to identify the degree of difficulty and discrimination index for each paragraph of the test, where the researcher found that the difficulty index for each paragraph ranged from (030 - 0.57), which indicates graduated

levels of difficulty. In addition to that, the discrimination index ranged from (0.40- 0.70) to distinguish between the responses of the upper and lower categories, where metrology accepts discrimination index when it reaches more than (0.20) (Kilani et al., 448: 2008). Based on the above, the researcher kept all of the test paragraphs.

- **Validity of the Test of Mathematical Skills:** The validity of the test was tested through presenting it to a group of (10) specialized university teachers to be guided from their views on the appropriateness of the paragraphs of the test to the teacher students of mathematics in Al Aqsa University and to confirm the appropriateness of the vocabulary used scientifically and linguistically; suggested modifications were taken into consideration.

The internal consistency of the test was ascertained using Pearson correlation between the scores of each paragraph of the test and the total score, in which the researcher found that all values of Pearson correlation are statistically significant at significance level (α = 0.01), which indicates that the test is strongly valid.

- **Reliability of the Number Sense Skills Test:** To test the reliability of the test of creative teaching skills, the researcher used Kuder–Richardson Formula 21 and found that the reliability coefficient is (0.857), which is highly reliable and statistically significant coefficient, which induces the researcher to apply the test on the study sample.
- **Determining the Test Duration:** The time needed to answer the test of creative teaching skills was determined by calculating the mean duration it takes for the first and last student to finish the test; it was found to be (40 minutes).
- **The Final Form of the Test of Mathematical Skills:** Based on the results of the arbitration and exploratory experimentation of the test and doing the necessary modifications, the number of test paragraphs after adjustment is (62) multiple choice questions, ready to be applied in its final form.

Fifth: Evenness of Study Groups

The evenness of the experimental and control groups was assured in terms of: (creative teaching skills pretest, note card pre-application, students' overall average, and chronological age). Table (1) illustrates this as follows:

Table 1

Variable	Group	Number	Mean	Standard Deviation	T value	Sig. Value	Significance Level
Creative teaching skills pretest	Control	40	12.650	3.900	1.036	0.303	Statistically insignificant
	Experimental	42	13.667	4.902			
Note card pre application	Control	40	1.566	0.187	0.806	0.422	Statistically insignificant
	Experimental	42	1.600	0.192			
students' overall average	Control	40	22.075	0.350	1.274	0.206	Statistically insignificant
	Experimental	42	21.998	0.176			
chronological age	Control	40	79.675	5.441	0.457	0.649	Statistically insignificant
	Experimental	42	79.071	6.456			

Limits of statistical significance at mean (α = 0.05), d.f. (80) and tabulated T-value is (2.00)

Limits of statistical significance at mean (α = 0.01), d.f. (80) and tabulated T-value is (2.66)

It is clear from the above table that the calculated T-value equals (1.036, 0.806, 1.274, 0.457), respectively, which is less than the tabulated T-value (2.00), at the degree of freedom (80) and the level of statistical significance (α = 0.05); this indicates to insignificant statistical differences between the experimental and control group, and thus both groups are even.

Sixth: Steps of the Study

The present study included the following steps:

- Review of educational literature related to the present study, in order to learn how to prepare the study tools.
- Preparation of the test of creative teaching skills and the note card.
- Application of tests and note card on a small sample in order to test its validity and reliability.
- Choose two classes randomly from teaching students of Mathematics of Al Aqsa University, in which one class was chosen as the experimental group and the other as the control group.
- Ensure evenness of the two groups in some variables in terms of creative teaching skills pretest, note card pre-application, students' overall average, and chronological age.
- Adopt the flipped learning strategy in teaching the experimental group.
- Application of the test of creative teaching skills and the note card on the study sample to detect the impact of using the Flipped Learning Strategy on the development of some creative teaching skills among students of Mathematics Teaching in Al Aqsa University
- Test grading, data collection, analysis of the results of the study, and discussion.
- Highlight the study recommendations in the light of its results, and then providing a set of proposals.

Seventh / Statistical Methods Used : The statistical Package for Social Sciences (SPSS) was used to perform the required analysis, in which the (T-test) for two independent samples was used to study the differences between the variables of the study.

Results of the Study (Discussion and Interpretation): Based on the study questions and hypotheses, the following results were obtained:

- **Presenting and Discussing the Result of the first Question:**

  What are creative teaching skills necessary for teacher students of the Mathematics at Al Aqsa University?

  To answer this question, the researcher followed the following steps:

Identifying the Purpose of the List: The list aims to identify the creative teaching skills necessary for teacher students of Mathematics in Al Aqsa University, in which it was divided into three categories (Planning, Implementation, and Assessment). To be able to prepare the list of creative teaching skills which should be developed among teacher students of mathematics in Al Aqsa University, the researcher reviewed the following resources:

- Researches and studies related to the development of creative teaching skills such as (Al-Nimr, 2014), (Abu Sitta, 2011), (Abu El-Ela, 2009) and (Najjar, 2012).
- Review of literature in the field of creative teaching and development of thinking, and preparation of an appropriate classroom environment.
- Study the results of some conferences and seminars that dealt with teaching skills.
- Surveying the opinions of a sample of specialists in mathematics and its methods of teaching through personal

interviews (Delphi method)

In the light of the above, a list of creative teaching skills has been prepared, which included three axes (planning, implementation, and assessment of teaching). The skills included fluency, flexibility, and originality that must be developed by teachers and which are expected to affect their teaching performance. In its final form, the list includes (64) skills.

Setting the List of Creative Teaching Skills: The initial form of the list was presented to a group of specialist in the field of curriculum, methods of teaching, and psychology, for the purpose of taking their opinions on the list in terms of: linking the sub-skills to the key skills, validating the relevance of the list and its relatedness to the field in which it was developed for, and to check the appropriateness of the linguistic phrasing; suggested modifications were taken into consideration, in which some skills have been omitted, added, replaced and modified. In addition to that, the approval rate of the paragraphs of the list has been calculated using the following equation: Approval Rate : [N1 .÷ (N1+N2)] × 100%, where N1 = Number of Approvers and N2= Number of disapprovers.

After calculating the frequencies, applying the previous equation, and omitting the paragraphs with an approval rate of less than 80%, a list of the creative teaching skills required for teacher students of Mathematics in Al Aqsa University has been organized.

The Final Form of List: Based on the results of the arbitration and doing the necessary modifications, the number of skills included in the final list after adjustment is (62) paragraphs, categorized under three main skills: Creative Planning (21), Creative Implementation (21) and creative assessment (20), with (2) supplementary skills.

- **Presenting and Discussing the Result of the Second Question**

What is the impact of employing the flipped learning strategy in developing some creative teaching skills among mathematics' teacher students of Al-Aqsa University?

To answer this question, the first hypothesis of the study was formulated, stating that there are no significant statistical differences ($\alpha \leq 0.05$) between the mean scores of the experimental group students and their peers in the control group in the cognitive post-test. To test this hypothesis, the T-test was used for two independent samples; the results were as illustrated in table (5**)**

Table 2: Shows the Results of T-test to Compare the Mean Scores of the Experimental Group Students and their Peers in the Control Group in the Cognitive Posttest

Group	Number	Mean	Std. Deviation	Calculated T-Value	Sig	p-value
Control	40	36.40	17.77	-7.888	0.00	Sig at 0.01
Experimental	42	58.67	4.26			

Limits of statistical significance begin at the level ($\alpha = 0.05$), d.f. (80) when the tabulated T-value is (2.00)

Limits of statistical significance begin at the level ($\alpha = 0.01$), d.f. (80) when the tabulated T-value is (2.66)

It is clear from the above table that the calculated T-value equal to (7.888), which is greater than the tabulated T-value (2.66), at the degree of freedom (80) and the level of statistical significance ($\alpha = 0.01$); this indicates to the existence of significant statistical differences between the mean scores of the experimental group and their peers in the control group in the post application of the note card; these differences were in favor of the experimental group.

Regarding the size of the impact of the employment of Flipped Learning Strategy on the development of some creative teaching skills among teacher students of Mathematics in Al Aqsa University, ETA square (η2) was calculated to make sure that the size of the T-test resulting differences are real differences caused due to the study variables, and are not coincidental. The following table illustrates this :

Table 3: Shows the Size of the Impact of the T-test of the differences between Students of the Experimental and Control Groups

Calculated T-Value	Value of ETA Square (η2)	d value	Size of Impact
7.888	0.437	1.76	Large

It is clear from the above table that the value of ETA square equals to (0.437), from where value of "d" has been calculated to be (1.76) which indicates a large impact, where (Afana, 2000: 42) indicates that the size of impact is considered large if the value of ETA square is greater than or equal to (0.14), as is the size of the impact is considered supplementary to the statistical significance and does not replace it. This result is consistent with all previous studies mentioned above, such as the study of Jalbeh (2016), Juhary (2015), Arcos (2014), Rozinah (2014) and Strayer (2007). The superiority of Experimental group over the control group may be due to the following reasons:

- Its implementation provides active learning standards within the classroom environment.
- It is characterized by flexibility and its ability to absorb an effective set of tools, techniques, and activities that contribute to the achievement of the desired teaching objectives.
- It provides students with motivation and enthusiasm.
- Its use transforms the classroom into a scientific arena full of cultural activities and entertainment, which is preferred to students as it adds excitement and suspense, and thus excludes routine and boredom from the classroom.
- It provides a collaborative learning environment free of fear, risk, tension, and anxiety, where students discuss their opinions in front of the entire class.
- It provides an opportunity to correct and stabilize students' knowledge, as a result of the feedback received by teacher students after their integration with the Flipped Learning strategy.
- It contributes to helping students understand and apply better creative teaching skills.
- It contributes to the smooth transfer and learning of experiences.
- It Promotes collaborative work among students and enables them to participate effectively in classroom discussions, discover knowledge and data and apply it in new situations.
- It deepens students' awareness of the usefulness of what they are studying, which helps generate ideas, develop capacity, organize information, and interacts deeply with the content of the subject.

- **Presenting and Discussing the Result of the Third Question:**

What is the impact of employing the flipped learning strategy on the performance of mathematics' teacher

students at Al-Aqsa University on creative teaching skills?

To answer this question, the second hypothesis of the study was formulated, stating that there are no significant statistical differences ($\alpha \leq 0.05$) between the mean scores of the experimental group students and their peers in the control group in the performance (note cared) post-test. To test this hypothesis, the T-test was used for two independent samples; the results were as illustrated in table (4**)**

Table 4: Shows the Results of T-test to Compare the Mean Scores of the Experimental Group Students and their peers in the Control Group in the Performance (Note Card) Posttest

Group	Number	Mean	Std. Deviation	Calculated T-Value	Sig	p-value
Control	40	2.839	0.147	23.114	0.00	Sig at 0.01
Experimental	42	4.514	0.435			

Limits of statistical significance begin at the level ($\alpha = 0.05$), d.f. (80) when the tabulated T-value is (2.00)

Limits of statistical significance begin at the level ($\alpha = 0.01$), d.f. (80) when the tabulated T-value is (2.66)

It is clear from the above table that the calculated T-value equal to (23.114), which is greater than the tabulated T-value (2.66), at the degree of freedom (80) and the level of statistical significance ($\alpha = 0.01$); this indicates to the existence of significant statistical differences between the mean scores of the experimental group and their peers in the control group in the post application of the note card; these differences were in favor of the experimental group.

Regarding the size of the impact of the employment of Flipped Learning Strategy on the performance of mathematics' teacher students at Al-Aqsa University on creative teaching skills, ETA square ($\eta 2$) was calculated to make sure that the size of the T-test resulting differences are real differences caused due to the study variables, and are not coincidental. The following table illustrates this :

Table 5: Shows the Size of the Impact of the T-test of the differences between Students of the Experimental and Control Groups

Calculated T-Value	Value of ETA Square ($\eta 2$)	d value	Size of Impact
23.114	0.869	5.16	Large

It is clear from the above table that the value of ETA square equals to (0.893), from where value of "d" has been calculated to be (5.16) which indicates a large impact, where (Afana, 2000: 42) indicates that the size of impact is considered large if the value of ETA square is greater than or equal to (0.14), as is the size of the impact is considered supplementary to the statistical significance and does not replace it. This result is consistent with all previous studies mentioned above, such as the study of Jalbeh (2016), Juhary (2015), Arcos (2014), Rozinah (2014) and Strayer (2007). The superiority of Experimental group over the control group may be due to the following reasons:

- The nature of the flipped learning strategy offers students the opportunity to ask questions, exchange discuss and examine ideas, as well as initiating and asking for the help of others.
- Creates a healthy and vibrant environment, which helps brings joy to the mathematics study.
- Flipped learning strategy creates a rich learning environment, keeping the students away from the stereotypes and

rigidity, transporting them towards innovation an advancement, which facilitates the development of creative teaching skills.

- Flipped learning strategy makes learning more influential, as it stimulates learners towards learning.
- It develops communication skills and enhances the spirit of cooperation and teamwork among students.
- It provides students with the opportunity to think and understand on their own.
- Takes into consideration the individual differences in students' abilities, by which it offers the possibility of representing the lectures more than once without feeling confused or ashamed.
- This strategy produces working students, who think and discuss what they are studying, which solidifies a coherent and consistent mathematical content in their minds and develops their reasoning abilities.
- Flipped learning strategy helps in the dual role of teacher students, by which they become teachers and participants at the same time
- It provides immediate feedback from the interviewer, which is a characteristic of self-learning.

Study Recommendations

In light of the findings of the study results, the following recommendations can be provided:

- Train and encourage universities' faculty members on the use of flipped learning strategy in educational lectures.
- Assigning practical hours to practice creative teaching skills in laboratories of teaching methods and teaching techniques in ways that lead to the continuation of their practice before and after graduation.
- Developing mathematics courses in the Faculty of Education by integrating creative teaching skills and flipped learning strategy.
- Adopting creative teaching skills while teaching lectures, in order to keep pace with the shift from teaching, which focuses on recalling acquired knowledge to teaching that focuses on the production of creative knowledge.
- Dissemination of the list of creative teaching skills prepared by the present study, for all teacher students of mathematics, to be able to develop the teaching methods used in public schools.
- Develop university teaching through the diversification of teaching methods, to include a variety of creative methods, including the flipped learning strategy.
- Provide Palestinian university lecturers with the required level of competencies related to the use of the flipped learning strategy.
- Reconsideration of the evaluation methods used in the Faculty of Education, including activities related to creative teaching skills, taking it into consideration when evaluating teacher students of mathematics, as well as conducting studies on the role of using the flipped learning strategy in teaching different subjects at different levels of study, and its impact on some learning outcomes, and revealing the effectiveness of the programs involved in this teaching strategy.

REFERENCES

First: Arabic References

1. *Ibrahim, Majdi Aziz (2005). Creative Teaching and Teaching Thinking, Cairo: The World of Books.*
2. *Abu El-Ela, Nanis (2009). A proposed training program for the development of creative teaching skills and strategies for female Teachers students of Mathematics Division, Journal of Mathematics Education (Research Journal Court) Volume XII, Faculty of Education, Banha University, Egypt, pp. 193 - 333.*
3. *Abu Jelbah, Munira. (2016). Effectiveness of the Flipped Classroom strategy using the Edomo site in the development of creative thinking and trends towards biology among students of the second phase in the city of Riyadh (unpublished master thesis). Imam Mohammed bin Saud Islamic University, Riyadh.*
4. *Abu Sitta, Ferial (2011). Effectiveness of a training program in developing creative teaching skills and reducing the anxiety of teaching among the students of the Faculty of Education within the framework of quality, Journal of Educational and Psychological Studies, Faculty of Education, Zagazig University, Part I (70).*
5. *Hamid, Amal (2016). The Effectiveness of the Flipped Classes and the Integrated Classes in Developing the Skills of Designing Educational Web Pages for Female Students of the Faculty of Education, Islamic University of Gaza, Unpublished Master Thesis, Faculty of Education, Islamic University: Gaza.*
6. *Zein, Hanan (2015). The Impact of Using the Flipped Learning Strategy on Academic Achievement of Female Students of the Faculty of Education, Princess University, Noura Bint Abdul Rahman University, International Specialized Educational Journal, Vol. 4, p.1.*
7. *Shadifat, Basil Hamdan (2010). The role of social studies teachers in the development of creative thinking among the Tenth grade students in the schools of Kasbah al-Mafraq from the point of view of teachers and students themselves. Journal of Human Sciences, Mg (7), p (45).*
8. *Saadi, Laila Saad (2007). Excellence, talent, creativity and decision-making: a vision from the reality of curricula, Dar Al-Hamed: Amman.*
9. *Abdellah, Nayel Yousef (2001). The effectiveness of a training program to develop some creative teaching skills among teachers of Arabic language and its impact on the development of creativity among their students, unpublished master thesis, Faculty of Education, New Valley: Assiut.*
10. *Afaneh, Ezzo (2000). The extent of the impact and its uses in revealing the credibility of the results in educational and psychological research, Journal of Palestinian Educational Research and Studies, Palestinian Educational Research and Studies Association, (3).*
11. *Al-Kilani, Zaid, Al-Taqi, Ahmad, and Adas, Abdul Rahman (2009). Measurement and Evaluation in Teaching and Learning, United Arab Marketing and Supply Company, PO Box 444-448.*
12. *Metwally, Alaa (2015). Employing the flipped learning strategy in the teaching and learning processes. The 15th Annual Scientific Conference of the Egyptian Society for Mathematics Education: Teaching and Learning Mathematics and Developing the Skills of the 21st Century - Egypt, pp. 90-107.*
13. *Najjar, Iyad (2012). The extent to which teacher students of science possess creative teaching skills at the College*

of Teachers in Qunfudah and its relation to their academic achievement, Journal of the Union of Arab Universities for Education and Psychology, vol. 10, pp. 2, pp. 148-168.

14. *Al Nimir, Mohamed Abdelkader (2014). "The extent to which mathematics teachers in the primary stage in Saudi Arabia possess creative teaching skills." Journal of Scientific Research in Education - Egypt P15, C3, pp. 765 - 796*
15. *Warthan, Adnan (2007). The extent to which teachers accept the overall quality standards in education, presented to the 14th annual meeting of the Saudi Society for Educational and Psychological Sciences (Justin) entitled Quality in Public Education.*

Second: Foreign References

1. *Bergmann, J., & Sams, A. (2014). Flipped learning: Gateway to student engagement. International Society for Technology in Education.*
2. *Brame, C. J. (2013). Flipping the classroom. Vanderbilt University. Center for teaching. Retrieved from: https://cft.vanderbilt.edu/guides-sub-pages/flipping-the-classroom.*
3. *Chang, C. P., Chuang, H. W., & Bennington, L. (2011). Organizational climate for innovation and creative teaching in urban and rural schools. Quality & Quantity, 45(4), 935-951.*
4. *Chipps, J. (2013). The effectiveness of using online instructional videos with group problem solving to flip the calculus classroom. Recuperado de http://jchipps. com/docs/thesis. pdf.*
5. *Crews, T., & Butterfield, J. B. (2014). Data for flipped classroom design: Using student feedback to identify the best components from online and face-to-face classes. Higher Education Studies, 4(3), 38.*
6. *De los Arcos, B. (23-25 April, 2014). Flipping with OER: K12 teachers' views of the impact of open practices on students. 10th annual open Courseware Consortium Global Conference "Open Education for a Multicultural World". Ljubljana: Slovenia.*
7. *Francl, T. J. (2014). Is Flipped Learning Appropriate. Journal of Research in Innovative Teaching, 71, 119-128.*
8. *Hantla, B. F. (2014). The effects of flipping the classroom on specific aspects of critical thinking in a Christian college: A quasi-experimental, mixed-methods study. Southeastern Baptist Theological Seminary.*
9. *Johnson, G. B. (2013). Student perceptions of the Flipped Classroom (Doctoral dissertation, University of British Columbia).*
10. *D. Indira Priyadarshini, Impact of Flipped Classroom, International Journal of English and Literature (IJEL), Volume 8, Issue 4, July-August 2018, pp. 1-4*
11. *Juhary, J. (2-5 March, 2015). Flipped Classroom at the Defence University: A Pilot Study, 4th – International Conference For E-Learning & Distance Education, Riyadh.*
12. *Keengwe, J. (2014). Promoting active learning through the flipped classroom model. IGI Global.*
13. *McDonald, K., & Smith, C. M. (2013). The flipped classroom for professional development: part I. Benefits and strategies. The Journal of Continuing Education in Nursing, 44(10), 437-438.*

14. *Marlowe, C. A. (2012). The effect of the flipped classroom on student achievement and stress (Master dissertation, Montana state University).*
15. *Miyagoshi, T., Shibata, K., & Tajima, M. (2007). A System Related to a Creative Subject in which All the Teachers Participate. IEEJ Transactions on Fundamentals and Materials, 127, 654-655.*
16. *Roach, T. (2014). Student perceptions toward flipped learning: New methods to increase interaction and active learning in economics. International Review of Economics Education, 17, 74-84.*
17. *Rozinah, J. (2014). The Use of a Flipped Classroom to Enhance Engagement and Promote Active Learning, Journal of Education and Practice. 124-131.*
18. *Strayer, J. (2007). The effects of the classroom flip on the learning environment: A comparison of learning activity in a traditional classroom and a flip classroom that used an intelligent tutoring system (Doctoral dissertation, The Ohio State University).*
19. *Vaughan, M. (2014). Flipping the learning: An investigation into the use of the flipped classroom model in an introductory teaching course. Education Research and Perspectives (Online), 41, 25.*