
The effect of 7E's use on developing the creative thinking skills for preparatory year students at Najran University

Talal Tayel Al-Mashagbeh

Najran University, Najran, KSA

Address for correspondence: Dr Talal Al-Mashagbeh, Faculty of preparatory year, Najran University, P.O. Box: 1988, Najran, Saudi Arabia. Email: talalmashaqbah@yahoo.com

ABSTRACT: *The study aimed to find out the effect of using the 7E's course on developing the creative thinking skills for students of the preparatory year at the University of Najran in the second semester of the academic year 2019/2020, and the researcher has used the semi-experimental approach. The study sample formed from (80) students of the preparatory year including two classes (control and experimental), the control group included (40) students, and the experimental group included (40) students. The researcher has used the test of creative thinking skills, and the test was applied to an exploratory sample including (20) students from outside the study sample, and the consistency of the test was calculated by using the internal consistency method Alpha Cronbach equation and it was (0.85). The results of the study showed that there are statistically significant differences at the level of significance ($\leq 0.05 \alpha$) between the mean scores of the experimental group that were studied using the 7E's course in the pre and post application to test creative thinking skills and in favor of post-implementation. The results of the current study showed that learning mathematics using 7E improves each sub-skill of the creative thinking skills.*

KEY WORDS: seven-year learning, creative thinking skills, fluency, flexibility, originality

INTRODUCTION

The scientific progress that we live today is the result of the efforts of many creators. The continuation of this progress depends on unleashing more creative potential inherent in individuals, as this progress has revealed many problems in various aspects of economic, social and political life, which need to rethink and find creative solutions not It comes only through preparing the individual to face such challenges. This has made learning thinking skills of all types one of the main goals that educational institutions seek to achieve in order to adapt to the developments.

Thinking is not only a retrieval of the experiences that an individual possesses, but also in its general sense which includes all kinds of mental activity among individuals, which is characterized by employing symbols, perceptions, language and concepts in the treatment of things and events instead of processing them through perceived physical activity (Al-Absi, 2009). Creative thinking is considered a requirement from Saudi Arabia vision, and an important skill of the twenty-first century skills, which consists of fluency, flexibility, and originality that students develop by training, and the teacher needs with his students, the leader in his leadership, and the thinker in his writing. Creativity is not considered exclusively for the first and talented, everyone can be creative by learning and training (Al-Hammad, 2018).

The researcher sees that the use of seven-way education in effective ways in teaching mathematics in a way. That is appropriate, deep thinking in the mathematics curricula and representing students' practices and generalizing them as a method that makes decisions about education, may contribute to the acquisition of the creative thinking skills, and the learner's understanding of basic information (concept, principle, basic law, theory). The learner applies this information to new learning situations / contexts, adjusting concepts or the wrong perceptions related to the subject of the lesson, developing scientific research skills, developing types of thinking, developing a trend towards the topic of the lesson, and developing discussion, dialogue and teamwork skills(Khatabiay, 2005: 315 and Shalayel 2003: 14).

The Study Problem

The researcher noticed during his teaching a weakness in the ability of students to think in general and creative thinking in particular, because of memorizing facts and concepts without the creativity and using traditional methods in teaching by teachers. This current study contributes to improving creative thinking skills in mathematics, universities in general and the University of Najran in particular need more than before to teach its students learning and teaching strategies. Provide students with wide and varied educational prospects that enrich their information, develop their mental skills, and train them to create and produce new and different things, which requires a specialized university professor that gives his students an opportunity towards creativity and use new strategies like 7E's strategy.

Therefore, attention must be paid to developing the creative thinking skills because creators are the hope of the nation and are able to advance their societies to the highest levels of progress and advancement of the human being. The interests of human societies with creativity are due to several factors, including the scientific and technological revolution and the rapid development of knowledge. The urgent need to present new typical ideas, to achieve this, a well prepared teacher who is able to teach the creative thinking skills must be prepared to develop among his students. The researcher's concentrates on students of the preparatory year college at the University of Najran considering them teachers will reflect what they learn on their students in the near future (Al-Qatami, 2003).

Study question

The current study aims to identify the impact of the use of the 7E's course in developing creative thinking skills among preparatory year students at the University of Najran. The study attempted to answer the following question:

How effective is the use of the 7E's course in developing the creative thinking skills for preparatory year students at Najran University in the Kingdom of Saudi Arabia?

The hypothesis of the study

To answer the study question, the following null hypothesis was formed:

There were no statistically significant differences at the level of significance ($0.05 \geq \alpha$) between the mean scores of the experimental group and the control group in developing the creative thinking skills test.

The importance of study

The importance of the study appears in the following:

Theoretical importance:

- Represented in what the current study will add new information and ideas to knowledge and to the Saudi library and Arabic library. As the current study topic is getting along with scientific trends and the skills of the twenty-first century that focus on thinking and the creative thinking skills in particular and emphasize the need to link the theoretical side with reality practical.

Applied importance:

- The study is gaining its importance, because it came to help students to build a deeper understanding of mathematics teaching activities using new strategies and use them in an effective way to acquire the creative thinking skills.
- Provide mathematics curriculum experts with some new strategies based on structural theory to use to enrich the mathematics course content.
- Reaching new ideas, thinking deeply about math curricula, translating students' practices, and generalizing them to make decisions about education.
- Contributing in acquiring the creative thinking skills to address renewable information of any kind as creativity skills are an example of providing the student with the tools. He needs to deal effectively with any type of information or changes, and from here education for thinking and learning. Creativity skills is gaining increasing importance as a need for student's success and Development School and community.

Study limits and limitations

- Spatial limit: The study was applied at the University of Najran.
- Time limit: applied in the second semester of the academic year 2019/2020
- Human limit: The study was limited to a purposive sample of preparatory year students (80) students.
- Objective limit: the study was limited to the creative thinking skills.
- The study tool (The Creative Thinking Skills Test) to measure the effectiveness of using 7E's strategy in teaching mathematics.

Procedural definitions

7E's Mathematics Teaching Strategy:

An effective teaching strategy depend on seven procedural stages, each stage begins with the letter E, where this strategy follows the structural learning theory and it depends on basic skills that help learners to think and build their cognitive structures themselves (Afanah and the army, 2008). The researcher defines it procedurally as a structural model consisting of seven stages that range from the stage of excitement/ activation to the exam / examination stage, and it is presented to the preparatory year. Students at the University of Najran in a sequential and comprehensive manner taking into consideration the nature of students and help them to develop their creative thinking skills and the ability to build mathematical knowledge by themselves.

As the education experts in Miami State in the United States of America (Meami, 2001) developed an effective teaching strategy that depends on seven procedural steps that start with the name as a step. A skill with the letter E where this strategy follows the theory of constructive learning and depends on seven basic skills that help learners to think and build cognitive structures by themselves.

The Creative Thinking Skills:

The creative thinking is a process of sensing problems, recognizing gaps and weaknesses, searching for and predicting solutions, formulating hypotheses, testing and reformulating them, and generating new solutions by employing available data to reach new results that the learner transmits to others and consists of skills such as fluency, flexibility, originality. The researcher defines procedurally the score achieved by students of the study sample on a special test that measures the improvement of the creative thinking skills and its indicators throughout the research.

As Torrance defined the creative thinking as a process of sensing problems, recognizing gaps and weaknesses, searching for solutions and forecasting, formulating and testing hypotheses, reformulating them and generating new solutions by using available data to reach new results that the learner transmits to others (Torrance, 2001).

Previous studies

Theme 1: 7E's Strategy

Bani Younis (2018) conducted a study aimed at investigating the effect of teaching mathematics using the 7E's course in achievement and mathematical prowess among ninth grade students in Jordan. The researcher used the semi-experimental approach, the study was applied to (40) students from the ninth grade students in Deir Alla, and the researcher has prepared two tests, one in achievement and the other in mathematical prowess. The researcher concluded that there are statistically significant differences between the mean scores of the experimental group that studied using 7E's and the control group that studied in the traditional way and in favor of experimentalism.

While (Al-shehry) study (2013) aimed to investigate the effectiveness of teaching mathematics, using 7E's in achieving and developing innovative thinking skills among first-grade middle school students. The researcher used the experimental approach, and the study sample consisted of (60) students and the study tools consisted of an achievement test and an innovative thinking skills test , the results of the study indicated for the effectiveness of 7E's.

Al-Banna study (2011) this study aimed to know the effect of using the modified 7E's learning course in teaching mathematical concepts on the achievement of the tenth-grade students and their ambition level. The study sample consisted of (60) students (the experimental group (30) students, which is taught using a course Learning and control group (30) students, which are taught in the normal way). The necessary tools for the study were prepared, that were the preparation of an achievement test and a scale to measure the level of ambition. The results of the study showed that there is a statistically significant difference on achievement in favor of the experimental group.

The study of Opas and others (2001) aimed to know the effect of using the 7E's course and multiple intelligences on achievement and critical thinking among tenth grade students in Thailand. the researcher used the experimental approach, and the study sample consisted of (100) students and the study tools consisted of testing achievement and critical thinking scale .The results indicated a statistically significant difference in favor of the experimental group studied using the 7E's course.

Theme 2: The Creative Thinking Skills

Ashour (2015) conducted a study entitled (the effectiveness of a program based on the TRIZ theory in developing the creative thinking skills and mathematical communication among fifth graders). It aimed to measure the effectiveness of the program in developing the creative thinking skills and mathematical communication among the fifth graders, she used the semi-experimental approach in purpose, fifth-grade students are divided into two experimental and control groups about (41) for each group. The study applied the creative thinking skills test, and the results concluded that there were statistically significant differences at the level of significance ($\alpha \leq 0.01$) between the mean scores of the experimental group and the control group in the creative thinking skills test for the benefit of the experimental group. The researcher recommended the need to train teachers to use the principles of the theory of TRIZ in the teaching of mathematics as one of the effective strategies in the development of thinking.

Ardogan and T. & Akkana (2009) conducted a study titled (The Impact of the Van Hayel Model on Improving the Creative Thinking for Sixth Grade Students). The study aimed to measure the effect of the Van Hayel Model on improving the creative thinking among sixth graders, and used the semi- experimental approach. The study was applied on a sample of (55) students divided into two experimental and control groups, and the researcher used the Torrance test for the creative thinking, and the study found. There is a statistical significance in favor of the experimental group (that used the Van Heil model).

A study by Al-Shihab (2003) aimed to identify the role of the teacher in developing the creative thinking among students in the government schools from the educational supervisors' point of view and the teachers in the Sultanate of Oman. The study sample consisted of (501) male and female teachers and (42) educational supervisors chosen randomly. The researcher used a questionnaire prepared specifically to reveal the extent of the teacher's practice of his role in developing the creative thinking. The researcher reached a set of results, the most important are that their practice of their role in developing the creative thinking among students from the point of view of educational supervisors was medium. Moreover, that teacher's practice their role in developing the creative thinking from the teachers 'point of view was high. And that there are statistically significant differences in estimating the degree of teachers' practice of their role in developing the creative thinking due to the variable of the job title and in favor of teacher appreciation. In addition, the absence of statistically significant differences in the degree of teachers' practice their role in developing the creative thinking due to the gender variable, years of experience and the educational qualification.

Commenting on the previous studies

The current study benefited from all previous studies, whether studies related to 7E's in mathematics or studies related to the creative thinking in building the theoretical framework and adopting the creative thinking skills and the ability to build the creative thinking skills test and the ability to determine the appropriate methodology. This study differed that it dealt with the undergraduate students, unlike previous studies that dealt with pre-secondary stages and it is considered the only study according to the researcher's knowledge, which dealt with the effect of 7E's on improving the creative thinking skills while most studies dealt with the innovative thinking and critic.

METHOD AND PROCEDURES

- **Study methodology:** The researcher adopted the semi-experimental approach.
- **Study Personnel:** The study members consisted of (80) students in the second semester of the academic year 2019/2020, and the preparatory year college at Najran University was chosen in purpose. The researcher has chosen the experimental group and the control group randomly. The control group class A (40) students and the experimental group class B (40) students.

Study tools

- **Firstly:** A Guide of using 7E's strategy in teaching Mathematics: The researcher has prepared a detailed guide of the procedures for using 7E's strategy in teaching mathematics.
- **Secondly:** The researcher prepared a creative thinking skills test to measure the effect of using the 7E's course in mathematics to improve numerical sense skills among preparatory year students at the University of Najran.

According to the following steps:

Refer to the theoretical literature and the previous studies to determine the basic skills that make up the creative thinking skills, and the indicators that demonstrate their acquisition among students (fluency, flexibility, originality)

- Building a specification table that determines the weight of the sub-skills that make up the creative thinking skills mentioned in each lesson.
- Prepare a set of questions that measure the creative thinking skills (fluency, flexibility, originality) according to the specifications table.
- Building a creative thinking skills test in its primary form.
- Applying the test to a prospective sample outside the study sample to determine the method for correcting the test and calculating stability and reliability.

The test came out in its final form, as it includes (16) items of multiple-choice type, measuring levels of the creative thinking skills (fluency, flexibility, and originality).

Stability of the creative thinking skills test:

The test was applied to a survey sample including (20) students from outside the study sample, and the stability of the test was calculated using the method of the internal consistency in the

Alpha Cronbach equation

The coefficient stability of the test was (0.84) indicates that the test has an appropriate degree of stability, and Table (1) shows the coefficient correlation and stability for each of the creative thinking skills individually.

Table 1: The coefficient correlation and stability for each of the creative thinking skills individually.

The skill	coefficient correlation	stability coefficient
Fluency	0.83	0.83
Flexibility	0.82	0.82
Originality	0.84	0.84

It is clear that the stability coefficients in Table (1) are between (0.81 - 0.87) and indicates that all paragraphs of the creative thinking test have an appropriate degree of stability.

The sincerity of the creative thinking skills test

To verify the validity of the test to measure what was set for its measurement, the researcher followed the following:

The honesty of the arbitrators

The researcher presented the test in its initial form including (18) paragraphs to a committee of specialized arbitrators, to seek their views on the comprehensiveness of the test items for the content. The appropriateness of the questions for students, the accuracy of the linguistic and scientific paragraphs, and take any necessary and important notes regarding the test, and it was agreed by the arbitrators are on the appropriate of (11) paragraphs , adjusting (4) paragraphs , canceling (3) paragraphs, and adding one paragraph to measure the creative thinking skills, and their applicability.

The validity of the internal consistency, and the researcher verified the validity of the internal consistency by calculating the Pearson correlation coefficient between the scores for each of the test items and the total score for the test using (SPSS) and Table 2 shows.

Table 2 : The correlation coefficient between the scores for each of the test items and the total score for the test

Question No.	The correlation coefficient	Question No.	The correlation coefficient
1	0.80	9	0.76
2	0.79	10	0.90
3	0.85	11	0.699
4	0.82	12	0.89
5	0.91	13	0.87
6	0.88	14	0.77
7	0.874	15	0.80
8	0.87	16	0.89

It is clear from Table (2) that all the paragraphs are statistically significant at the significance level ($\alpha \leq 0.05$), this indicates that the test questions are consistent with the overall score for the test as a whole, so the test is internally consistent.

Equivalent the study groups

To find the statistical significance of differences according to the variable of learning strategy using 7E's in mathematics, the researcher used the t-test as shown in the table. Table (3) Results of the t-test to indicate the differences between the experimental and control groups in the pre-application of the creative thinking skills according to the variable of the teaching strategy to indicate the equivalence of groups.

Table (3)

The group		The number	Arithmetic average	standard deviation	Value of -t	
The fluency	Control	40	3.37	0.54	-0.625	Is not significant
	Experimental	40	3.12	0.87		
The flexibility	Control	40	3.77	0.77	1.22	Is not significant
	Experimental	40	3.59	0.86		
The originality	Control	40	3.8	0.56	-1.29	Is not significant
	Experimental	40	3.19	0.62		
The test as a whole	Control	40	3.65	0.62	-0.892	Is not significant
	Experimental	40	3.3	0.78		

In view of the results of the analysis of variance shown in Table (3), it is clear that there are no statistically significant differences at the level of significance ($0.05 \geq \alpha$) between the arithmetic mean of the performance of the study members. In the test of creative pre-thinking skills due to the variable of the seven-year learning course in the teaching of mathematics where the value of statistical significance was greater than the significance level (0.05), which indicates the equivalence of the study groups on the pre-creative thinking skills test and this is what called the experimental control .

Study procedures

To achieve the goals of the study, the researcher has done the following procedures:

- Getting the necessary approvals and permissions to conduct the study.
- Preparing the tools and the guide of using the 7E's Course in Teaching Mathematics.
- The experimental group and the control group were randomly assigned.
- Building a creative thinking skills test (fluency, flexibility, originality), and applying it on a prospective sample to verify all psychometric properties.
- Applying the creative thinking skills test on the experimental and control groups (the pre- application), and exposing the control group to treatment (7E's course) without the experimental group for a period of two months
- After the researcher finishes teaching the creative thinking skills test, he applied the test on the students of the experimental and controlling groups in the school (post-application).
- Correcting the test of the creative thinking skills, and the rules and standards have been specified to be followed by the checker.
- Organizing and entering data into a computer, and analyzing it statistically using the Statistical Package for the Humanities and Social Sciences (SPSS) program.

The study variable:

This study includes the following variables:

- Independent variables: The teaching method has two levels: the use of 7E'S in teaching mathematics, and the regular method.
- The dependent variables are: creative thinking skills (fluency, flexibility, originality).

The study design

This study adopted a semi-experimental approach, and attempted to examine the impact of the use of the 7E's course in teaching mathematics to improve the creative thinking skills.

EG: O1 X O1

CG: O1 - O1

indication of the symbols -

EG: The experimental group

CG: The control group

O1: Creative Thinking Skills Test (before and after)

X: Experimental processing (teaching using 7E's)

Statistical processing to determine the effect of the E's7 teaching method the following statistical processing were used: mathematical averages and standard deviations to determine the creative thinking skills of the experimental and control group, and to determine the level of return from the use of the E's7 math teaching strategy on experimental group students.

One-Way ANOVA analysis of arithmetic means to determine the significance of differences in the apparent mean between the experimental group and the control group (equivalence of the study groups). T t-test to indicate the differences between the experimental and control groups.

THE RESULTS OF THE STUDY AND ITS INTERPRETATION

Discussing the results related to the study question "are there statistically significant differences between the average scores of the experimental group students studying mathematics using the 7E's , and between the control group that uses the usual method in testing the creative thinking skills". The accompanying zero hypothesis which states "There are no differences" Statistically significant at the significance level ($0.05 \geq \alpha$) between the mean scores of students of the experimental group who used mathematics teaching using 7E's and the control group who used the usual method of testing creative thinking skills. The researcher showed the standard deviations and deviations so that the researcher can identify the differences between the average performance in the test of creative thinking skills of the two groups of experimental and control groups, and these differences are shown in Table (5).

Table 5: Arithmetic averages and standard deviations for the performance of preparatory year students in the pre and post creative thinking skills test according to the method of teaching.

The skill	The group	The number	The pre-application		The post-application	
			Arithmetic average	standard deviation	Arithmetic average	standard deviation
Fluency	the experimental	40	3.37	0.54	3.85	0.40
	the control	40	3.12	0.87	3.37	0.64
Flexibility	the experimental	40	3.77	0.77	4.13	0.76
	the control	40	3.59	0.86	3.74	0.91
Originality	the experimental	40	3.8	0.56	3.79	0.37
	the control	40	3.19	0.62	3.33	0.51
The skill as a whole	the experimental	40	3.65	0.62	3.92	0.51
	the control	40	3.3	0.78	3.48	0.69

The results in Table (5) indicate that there are apparent differences between the arithmetic averages of the performance of the preparatory year students in the University of Najran on the creative thinking skills test, as a whole according to the two study variables. The teaching method (teaching mathematics using 7E's, and the usual method), the average arithmetic for group students Experimental (3.65) with a standard deviation (0.62), whereas the mean for the control group (3.3) with a standard deviation (0.78) and also visible differences for each of the creative thinking skills. That is, there are statistically significant differences at the significance level ($5 \ 0.05 \ \alpha$). That is, to reject the zero hypothesis and accept the alternative hypothesis; that is, there are statistically significant differences at the significance level ($\leq 0.05 \ \alpha$) between the mean scores of the experimental group that studied mathematics using the 7E's course in the pre- post application of the creative thinking skills test and in favor of dimensional application .

The results of the current study showed that learning math with 7E's improves the creative thinking skills in mathematics as a whole, and improves each sub-skill of skills (fluency, flexibility, originality).

The researcher refers this to the following reasons:

Use 7E's as a new strategy that achieves to students the ability to think creatively and generate a large number of alternatives or synonyms or ideas or problems or uses. The ability to generate diverse ideas that are not usually the type of ideas expected, and direct or transform the path of thinking with the motivation factor change or the trends requirements and seeking for modernity and uniqueness.

Recommendations

Depending on the results of the study and its conclusions, the researcher provides some recommendations and suggestions:

- Use the 7E's course in mathematics teaching to provide students some mathematical concepts.
- Give training courses for teachers to use 7E's course in mathematics teaching.

Statements on open data, ethics and conflict of interest

- a. Data can be accessed by contacting authors. (Elfeky & Elbyaly, 2016, 2017, 2018)
- b. No agreements of any type were needed as all participant students were enrolled in a course taught by an instructor who was one of the researchers of the present at Najran University. (Elfeky, 2017; Masadeh & Elfeky, 2016; Elfeky & Elbyaly, 2019)
- c. The authors declare that they have no conflict of interest. (Elfeky, Masadeh, Elbyaly, 2020)

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