The Effect of Electronic Educational Games on the Information Generation Skills of the First Intermediate Grade Students in Mathematics

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Abstract

The research aimed to identify the effect of electronic educational games on the achievement and information generation skills of first-grade Intermediate school female students in the schools of the General Directorate of Education in Baghdad/Al-Karkh III.

To achieve this goal, the following two zero hypotheses were formulated:

"There is no statistically significant difference at the significance level (0.05) between the average scores of the female students of the experimental group who studied using electronic educational games, and the scores of the female students of the control group who studied using the usual method in the mathematics achievement test."

"There is no statistically significant difference at the level of significance (0.05) between the average scores of the female students of the experimental group who studied using electronic educational games, and the scores of the female students of the control group who studied using the usual method in the test of information generation skills in mathematics."

The research population was determined as it represented all female students in the first intermediate grade in the Intermediate and secondary day schools affiliated with the General Directorate of Education of Baghdad/Al-Karkh III for the academic year (2022-2023). The Hashimiya Intermediate School for Girls was chosen intentionally, and the research sample consisted of (60) students, with (30) female students. in the experimental group, and (30) students for the control group.

For the purpose of collecting data for the research, an achievement test and an information generation skills test were prepared. The achievement test consisted of (32) objective multiple-choice items, and the information generation skills test in its final form consisted of (16) essay items.

Appropriate statistical analyzes were conducted, where the difficulty, ease, and discrimination coefficients were calculated for all items of the two tests. The validity of the two tests was verified, their stability was calculated, and they were found acceptable. The effectiveness of the false alternatives to the achievement test was good, and the correlation coefficients were calculated to test information generation skills, and after statistical tools were chosen to analyze the results. Applying the test such as the Statistical Portfolio for the Social Sciences (SPSS-22), Levene's test for two independent samples, and using the t-test for two independent samples. The results indicated:

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1-The female students of the experimental group who studied using electronic educational games outperformed the female students of the control group who studied using the usual method in the achievement test.

2- The female students of the experimental group who studied using electronic educational games outperformed the female students of the control group who studied using the usual method in the test of information generation skills in mathematics.

Keywords: *electronic educational games, achievement, information generation skills.*

1. Introduction

Learning mathematics is one of the important pillars of teaching in education, especially in the current era in which mathematics is intertwined with the world of computing and programming, and in which educational systems face a problem in the face of the knowledge revolution and rapid and complex technological developments that require them to provide learners with the necessary skills to deal with cognitive and technological development. And controlling matters, the importance of mathematics and the importance of teaching it increased, despite the continuous complaints of students in learning it, [1] & [2] due to the noticeable deficiency in the performance of teachers in general teaching skills and mathematics delivery skills Especially [3] .A gap has been created between mathematics and reality, which has made many students hate mathematics and know no reason other than passing the test. [4]

And because the traditional method reduces the student's benefit from his mental abilities, as it does not enhance his thinking and various skills, and makes him memorize the information without understanding it [5] because in this method the teacher speaks most of the time and the student remains a recipient of the information without allowing He has the active participation that makes him active and able to understand, so his achievement level will be low, [6] Therefore, it is necessary to find new and effective methods and methods in teaching mathematics, so that they do not feel an obstacle between what they learn in the classroom and what they learn in reality, and make them positive Interactive, motivated and willing to learn. [7] , [8] and that the development of thinking skills, especially information generation skills, is necessary for the study of mathematics, and despite this, many studies have shown that there is a decrease in the levels of information generation skills among students, and according to that we need what helps in developing This skill, given that educational games depend mainly on thinking, imagining, contemplating, and generating a response to that, will help students develop their information generation skills. [1]

1.1. Research question:

What is the effect of electronic educational games on the achievement and information generation skills of first intermediate school female students in mathematics?

1.2. The Importance of Research

1.2.1. Theoretical importance:

a) Presenting the research as an attempt to introduce the teaching method using electronic educational games through the computer to schools, in an effort to spread it to other subjects and different stages.

b) Emphasizes the importance of learning using educational games in mathematics, because of their significant impact in raising the level of female students and providing them with theoretical scientific knowledge and mental activity that lasts for a longer period.

c) The research results encourage mathematics teachers to design and implement new electronic educational games that suit students' levels, enhance their learning and push them towards learning.

1.2.2. Applied importance;

a) This research makes it easier for researchers and teachers to access applications and programs for designing educational games. It also presents an electronic game model that is useful in different subjects of mathematics and for different stages.

b) This research presents a test of information generation skills subject to a group of arbitrators, which benefits teachers and researchers in the education process.

c) The method of teaching using electronic educational games benefits teachers of mathematics, as it is a modern method that combines fun and learning and increases students' motivation towards learning in order to reach better results.

1.3. The Aims of Research:

The research aims to identify the impact of electronic educational games on:

1- Achievement among first-year intermediate school students in mathematics.

2- Information generation skills among first-year intermediate school students in mathematics.

1.4. Hypotheses of Research

1- "There is no statistically significant difference at the significance level (0.05) between the average scores of the female students of the experimental group who studied using electronic educational games and the scores of the female students of the control group who studied using the usual method in the mathematics achievement test."

2- "There is no statistically significant difference at the significance level (0.05) between the average scores of the female students of the experimental group who studied using electronic educational games and the scores of the female students of the control group who studied using the usual method in testing information generation skills in mathematics."

1.5. Limits of Research

The search is determined by all of the following:

(1) Female students in the first intermediate grade in the intermediate and secondary day schools affiliated with the General Directorate of Education in Baghdad / Al-Karkh III.

(2) Content of the mathematics book, Part One, scheduled to be taught to first-year intermediate students by the Iraqi Ministry of Education, 7th edition, 2022 AD.

1.6. Definitions of the Terms:

1.6.1. Electronic educational games:

An activity organized through the computer that follows a set of rules in the game, and these games are often in the form of educational matches that encourage students to compete to earn points." [9]

The two researchers define them procedurally: as games characterized by excitement, fun, and suspense, through which the learner learns concepts and skills, so that he understands them, masters them, and applies them easily. This learning is done through computer software that aims to combine learning and entertainment.

1.6.2. Achievement:

It is an organized procedure according to specific criteria aimed at knowing what the learners have reached and acquired from the facts, concepts and skills after studying the subject of the study regardless of its pages."[5]

The two researchers define it procedurally: it is the result of the students with the information, knowledge and skills that they acquired during the learning period in the classroom, and it is measured by the final score that they get after passing the test.

1.6.3. Information generation skills:

Skills that the learner has that need to be refined and trained, and this is done in a learning environment characterized by creativity and innovation, which enables the learner to provide unfamiliar solutions to the new problems he faces.[6]

The two researchers define it procedurally: the ability of first-year intermediate school female students to solve a problem, by practicing a set of mental processes, namely (fluency, flexibility, developing hypotheses, and predicting in light of the data), and it is measured by the score that the students obtain in the test that the researchers prepared for this purpose.

2. Theoretical background

2.1. The concept of electronic educational games:

Electronic educational games are a type of computer-assisted learning, and the concept of electronic educational games has several definitions. Everyone knows them as:

"Integrating education with play to achieve educational goals, in which students compete to obtain points in an atmosphere of excitement and suspense, which increases the student's motivation to continue playing." [10]

"games through which the student learns indirectly from the plan he makes to win the game, and the role of the computer, if the student makes a mistake in his plan, is to inform him of his mistake and give him hints that make it easier for him to modify the plan and try again, and so on until he reaches success." The computer's hints are based on elements of the scientific topic that the game seeks to teach. [11]

 "An organized activity through the computer that follows a set of rules in play. These games are often in the form of educational matches that force students to compete to earn points." [9]

 2. 1.1. The importance of electronic educational games and their benefits:

 [12] mentions that electronic educational game programs have an educational and educational importance, as he mentions that they are the interaction that the software achieves for the learner, this interaction that leads to increasing his motivation and his desire to obtain information through discovery, stimulation of thinking, and the development of his self-learning skills, as it is a type of computer program in which Employing more than one medium, such as designing screens, sound effects, animation, static graphics, video clips and audio backgrounds for the student to interact with when displaying information within the educational software.

Electronic educational games are the most common and exciting interactive software, as the computer, as mentioned [9], through the software stimulates students and pushes them to learn by playing, where there is an interesting game that includes in its context a specific concept or a specific skill. Although it takes time, it helps the student to learn new information and skills, to link learning with play, and this learning is accompanied by the pleasure of gaining experience.

Among the benefits of electronic educational games is that they provide a natural learning environment, and there is no doubt that learning in a natural environment is better than learning in an artificial atmosphere, and the natural environment in the style of electronic educational games leads to stimulating the learner's motivation, and provides two elements, which are competition and cooperation according to the objectives of the game, as well, Simplify and facilitate the learning of complex and time-consuming processes, reduce teacher control that often frustrates students, and provide information in a more motivated and purposeful manner. [9]

2. 1.2. Advantages of using electronic educational games:

(1)   Make the learner participate positively and effectively to gain experience, and learning through games is accompanied by a process of enjoyment.

(2)   Electronic educational games control the learner's feelings and make him interact with them with more than one sense, which leads to focus and interest in the activity he is practicing.

(3)   This style helps to provide the opportunity to learn in many cases for people who do not benefit from the traditional method of learning because they need more excitement and interaction to complete the learning.

(4)   This pattern in the educational process is compatible with different stages, some of which are used in kindergarten stages to develop mathematical, scientific and social concepts, and some of them are consistent with training problems for adults, and some are used in general education stages.

(5)   It makes a person practice many mental operations while playing the game, such as understanding, analysis, synthesis, and issuance of judgments, and also makes him acquire some popular intellectual habits such as problem-solving, flexibility, initiative, and imagination.

(6)   Develops students' muscular and visual coordination.

(7)   Develop the student's ability to observe, to identify illogical things among a group of stimuli.

(8)   Electronic educational games use various suspense elements, such as colors, sounds, graphics, and video presentations, which contribute to attracting the student towards the learning process.

(9)   The learner feels that he has the ability to control and control the environment, and makes him make an effort to reach the results he seeks to achieve, which contributes to training the learner on planning.[13],[14] and [9]

2. 2. Achievement:

2. 2.1. Achievement concept:

Academic achievement is one of the most important topics that has received the attention of psychologists, sociologists, and educational and pedagogical circles. It is a subject for dialogue and discussion and a field for research and studies because of the importance it acquires and its great role in preparing young people in a way that will be sufficient to unleash their energies and contribute to achieving the goals of society. This is why several definitions have emerged for this. In terms of the concept, achievement can be referred to as every performance performed by a student in various school subjects, which can be measured by test grades, teachers' estimates, or both. It can be said that achievement is the acquisition of knowledge and skill, and this in two ways:

The first aspect: It relates to the scientific subjects that are conducted and taught in schools of all types and grades.

The second aspect: It relates to the activities that a person studies diligently and skillfully in school, such as the arts, and outside school, such as professions and industries.[15]

2.2.2. Factors that influence achievement:

Despite the importance of academic achievement as a criterion by which a student's level can be determined through educational processes aimed at building his personality, we cannot rely on the veracity of the achievement grades he obtains, because there are several factors that affect those grades, and these factors can be classified into (Physical, mental, psychological or emotional, economic, family, school). [16]

2.2.3. Reasons for low achievement in mathematics:

Reasons for low achievement in mathematics:

(1)   Assigning teachers to give additional classes to students, which negatively affects their activity and performance in teaching and thus causes a decline in achievement.

(2)   Weak foundation and previous mathematical background negatively affect learning in the later stages.

(3)   The difference and lack of sequence in sports academic subjects from the primary stage all the way to the intermediate school stage negatively affects their achievement .[17]

2.3. Information generation skills:

2.3.1. Dimensions of information generation skills:

[18] defines two dimensions of information generation skills and the skills included in each of them as follows:

First: The exploratory dimension, which includes:

(1)   Hypothesizing.

(2)   Prediction in light of the data extrapolating.

Second: The innovative dimension, which includes:

(1)   Fluent.

(2)   Flexibility. [19]

2.3.2. The importance of information generation skills in the learning process:

The importance of information generation skills is represented by the following points:

(1)   It gives the learner an active role in the learning process and achieves learning effectiveness.

(2)   It helps to consolidate the concept of learning in the learner for life.

(3)   It helps the learner to come up with new ideas through previous experiences.

(4)   Contribute to training the learner to produce ideas and information instead of receiving them.

(5)   It helps to enhance the self-confidence of the student, and makes him feel the importance of his role in producing solutions and ideas.[20]

3. Research Methodology:

The two researchers followed the experimental method, based on the nature of the research and the goals it seeks to achieve, which is a plan followed to identify and control all variables that affect the dependent variables.

3.1. Research Population:

The research community represents all the students of the first intermediate grade in the intermediate and secondary day schools of the Directorate General of Education Baghdad / Karkh, the third for the academic year (2022-2023).

3.2. Research Sample:

The sample for the current research was chosen, with a total of (60) female students distributed equally into two groups: the experimental group numbered (30) students, and the control group numbered (30).

3.3. Research Tools:

3.3.1. Achievement test:

The two researchers built two research tools to verify the goal and hypotheses of the research. The two researchers prepared a test to measure the achievement of first-year intermediate school female students. (32) Objective items of the (multiple choice) type were formulated with four alternatives. One of the alternatives is correct and the rest are wrong.

The two researchers verified the validity of the test by presenting the test to a group of arbitrators in the specialty of mathematics teaching methods, to ensure its validity and whether it is suitable to be applied to female first-year intermediate students. The final paragraphs obtained an agreement of (85%), and none of them were deleted. The test was ready to be applied to the sample, and the two researchers applied the achievement test to a group of (133) female students, and their response scores were determined. Some statistical analyzes were conducted, including the difficulty factor, the discrimination factor, the effectiveness of the wrong alternatives for each item of the test, and the validity and reliability. It was evident from the indicators are that all paragraphs are acceptable and ready to be applied to the final sample.

3.3.2. Information generation skills test:

After reviewing the studies that dealt with this variable, and consulting a number of specialists in the field of mathematics teaching methods, four skills were identified (fluency, flexibility, hypothesis development, prediction in the light of the data) and they were relied upon in constructing the test. 16 paragraphs of the type of paragraphs were formulated Instructions for answering the test items were prepared to make it easier for students to understand what is required of this test, and they include information specific to the students, the number of test items and how to answer them, and an example showing how to answer the items. A correction key was prepared for the information generation skills test items, and was approved during The marking process, and after it was presented to a group of arbitrators, grades were allocated according to the essay paragraphs, and the final grade was (40) marks. The test was presented to a number of arbitrators in mathematics and its teaching methods, and the paragraphs that received a greater percentage of agreement were accepted. from 80% .

The ease, difficulty and distinctiveness of the test items were verified. The apparent validity was also verified by presenting the test to a number of arbitrators in mathematics and its teaching methods. The items that received an agreement rate of more than 80% were accepted. The construct validity was verified by finding the relationship correlation between

(The score for each item and the skill scores associated with it, the scores for each skill and the overall test score). According to the reliability coefficient of the test of information generation skills for female students in the second exploratory sample, the researcher used the (Kudder-Richardson-k21) equation to calculate the reliability of the test.

3.4. Statistical means to interpret the results

The two researchers used the appropriate statistical methods to search, including the statistical bag (spss-22), Levin's test for two independent samples, and the t-test for two independent, unrelated samples.

4. Results and discussions:

4.1. Presentation and discussions of results related to the achievement test:

For the purpose of validating the results related to the first null hypothesis, which states that:

There is no statistically significant difference at the level of significance (0.05) between the mean scores of the students of the experimental group who studied using electronic educational games and the scores of the students of the control group who studied in the usual way in the mathematics achievement test.

Where the arithmetic mean of the scores of the experimental group was (15.50), while the arithmetic mean of the scores of the control group was (11.63). The following were studied using electronic educational games on the students of the control group who studied in the usual way, and to search for the significance of the difference between the two averages, the t-test was used for two independent samples, as the result showed that the value of (t) (3.317) at the level of significance (0 .002) and this is smaller than the approved level of significance (0.05) and with a degree of freedom (58), thus rejecting the null hypothesis and accepting the alternative.

Table (1) Statistical description of the two groups (experimental and control)

group	number	Mean Score	Standard Deviation	Standard deviation Standard error	95 %confidence interval for the mean	
					upper limit	lower limit
Experimental	30	15.50	4.31	0.78601	6.0033	1.53301
control	30	11.63	4.72	0.86101	6.20074	1.53260

The results shown in Table (1) showed that the performance of the female students in the experimental group who studied mathematics using electronic educational games in the achievement test was better than the female students in the control group who studied the same subject in the usual way, and this is explained by one or more of the following factors:

(1)   Electronic educational games contain continuous immediate reinforcement and immediate feedback after every response made by the student, which helped increase their motivation to learn, their interaction with the games, and their involvement in them throughout the learning period, thus increasing their achievement.

(2)   Electronic educational games are characterized by the fact that they display the educational material on screens that use multimedia, such as attractive colors, sound effects, animated graphics, and shapes, which makes the students interact with them with more than one of the different senses, so that the concepts and skills are addressed visually and auditory, and this helps to retain the information and concepts for a longer period. .

(3)   Electronic educational games are distinguished by their ability to combine education, entertainment, fun, and excitement, and break out of the educational atmosphere that is characterized by monotony, stagnation, boredom, and repetition, and

make the students more attracted and focused during learning, which led to the acquisition of concepts and their consolidation in their minds.

4.2. Presentation and discussions of results related to the information generation skills test:

For the purpose of validating the results related to the second null hypothesis, which states that:

"There is no statistically significant difference at the significance level (0.05) between the average scores of the female students of the experimental group who studied using electronic educational games and the scores of the female students of the control group who studied using the usual method in the test of information generation skills in mathematics."

The arithmetic average of the scores for the experimental group reached (27.80), while the arithmetic average of the scores for the control group reached (22.23). When comparing the arithmetic averages of the scores of the two groups, it becomes clear that the arithmetic average of the scores of the female students in the experimental group is higher, and this indicates the superiority of the female students in the experimental group. Those who studied using electronic educational games over the control group students who studied in the usual way, and to search for the significance of the difference between the two means, a t-test was used for two independent samples, where the result appeared that the value of (t) (3.185) is at the significance level (0). .002) This is smaller than the approved significance level (0.05) and with a degree of freedom (58), and thus the null hypothesis is rejected and the alternative is accepted.

Table (2) Statistical description of the two groups (experimental and control

group	number	Mean Score	Standard Deviation	Standard deviation Standard error	95 %confidence interval for the mean	
					upper limit	lower limit
Experimental	30	27.80	6.18	1.12791	9.06559	2.06774
control	30	22.23	7.31	1.33536	9.06767	2.06566

The results shown in Table (2) showed that the performance of the female students in the experimental group, who studied mathematics using electronic educational games in the information generation skills test, was better than the performance of the female students in the control group, who studied the same subject in the usual way, and this is explained by one or more of the following factors. :

(1)   Electronic educational games provide an exciting educational climate that makes students mentally active and more effective, which helps them build their knowledge by thinking about solving a new mathematical problem.

(2)   Electronic educational games stimulate thinking in the learner and work to increase mental development, especially in the skills of generating information.

(3)   The game aims to make the student fit into her imagination so that she can try to come up with new ideas to achieve the goal. The imagination that the students show when playing the game may have great value in the ability to produce information.

(4)   The method of teaching using electronic educational games departs from what is usual in education, which enables female students to memorize, understand, organize and retain the scientific material, which enables them to retrieve it and not forget it.

(5)   Educational games make it easier for students to master information with the ability to think fluently and flexibly and give diverse and multiple responses by responding with the game.

5. Conclusions:

(1)   The method of teaching using electronic educational games is easy, smooth and comfortable for the teacher to implement, and it creates a tedious and enjoyable atmosphere in the classroom, while it requires high skill in preparing the lesson and requires a lot of time and effort.

(2)   The method of teaching using the electronic educational process has a clear effect in raising the level of achievement of the students of the experimental group in mathematics, compared to the level of the students of the control group of students in the first intermediate grade.

(3)   Teaching using electronic educational games made the student the focus of the educational process, and provided her with the opportunity for expression and thinking.

6. Recommendations:

(1)   Activating the teaching method by using electronic educational games in teaching mathematics curricula to first-grade students, as it has a positive impact on their achievement.

(2)   Invite the competent authorities (preparation and training) in the Ministry of Education and its directorates to organize training courses on programs for designing, producing and applying electronic educational games for teaching mathematics.

(3)   Invite the concerned authorities in the Ministry of Education and its directorates to equip the laboratories with modern and developed computers that can accommodate the programs for designing games to suit the teaching method and make it easier for students to access them, and this would make the students' role effective with the subject through the game.

(4)   Enriching mathematics books with models of electronic educational games that suit each subject of the mathematics book for the first intermediate grade to help teachers innovate.

(5)   An invitation to the faculties of education to include in the content of teaching methods courses topics related to electronic educational games and their educational applications, to train their students before graduation, and to develop their skills in producing and designing electronic educational games so that it is easier for them to apply them when they start practicing the teaching profession.

References

Jawad, L. F., Majeed, B. H., & ALRikabi, H. T. (2021a). The Impact of Teaching by Using STEM Approach in The Development of Creative Thinking and Mathematical Achievement Among the Students of The Fourth Scientific Class. International Journal of Interactive Mobile Technologies, 15(13).

Majeed, B.H., Hassan, A.K., Hammadi, S.S.(2023). The Effect of Cognitive Modeling in Mathematics Achievement and Creative Intelligence for High School Students. International Journal of Emerging Technologies in Learning, 18(9), pp. 203–215

Hassan, Areej Khader (2018). Evaluating the quality of teaching skills of mathematics teachers in the intermediate school/scientific branch from their point of view. Journal of Educational and Psychological Research, 14 (52), pp. 438-

Al-Aqabi, Ali Khazal Jabr; Kadhimi, Hiyam Mahdí Jawad Al .(2023) , The Effect of Proposed Strategy According to The Realistic Mathematics Theory on The Achievement and Mathematical Interrelation of third Intermediate Students ,   (Journal of Educational and Psychological Researches , 20,(77) ,391- 415.

Jawad, L. F., Raheem, M. K., & Majeed, B. H. (2021b). The Effectiveness of Educational Pillars Based on Vygotsky's Theory in Achievement and Information Processing Among First Intermediate Class Students. International Journal of Emerging Technologies in Learning (IJET), 16(12), 246-262.

Hasan ,Istiqlal Falih ‚Faris ,Elham Jabbar (2019(.The of Effect Instructional Design based on Kagan Structure In Generating Information Skills for First Intermediate Student's In Mathematics. Journal Of Educational and Psychological Researches, 16(62), Issu, , 301-322.

Hassan, A. K., Hammadi, S. S., & Majeed, B. H. (2023). The Impact of a Scenario-Based Learning Model in Mathematics Achievement and Mental Motivation for High School Students. International Journal of Emerging Technologies in Learning (Online), 18(7), 103.

Hassan, A.K. (2017). The effectiveness of the proposed educational design based on the teaching strategy for understanding in the achievement of fifth-grade mathematics students. Journal of Educational and Psychological Research, 14, pp. 1-22.

Al-Far, Ibrahim Abdel-Wakeel (2004): Computer Education and the Challenges of the Early Twenty-First Century, Dar Al-Fikr Al-Arabi, Cairo, Egypt.

Al-Omari, Abdullah Saad (2001): Computer technology and its role in the educational process, Studies in Curricula and Teaching Methods, 73 (September), 115-187.

Hussein, Mohamed Abdel-Hadi (2002): The use of computers in the development of innovative thinking, Dar Al-Fikr, Amman, Jordan.

El-Sayed, Atef (2004): Information Technology and Computer, Video and Interactive Education, Anglo-Egyptian Library, Cairo, Egypt.

Salama, Abdel Hafez and Abu Rayya, Muhammad (2002): Computers in Education, Al-Ahlia Publishing and Distribution, Amman, Jordan.

Salem, Ahmed and Saraya, Adel (2003): Education Technology System, Al Rushd Library, Riyadh, Saudi Arabia.

Sheikhi, Rashid (2014). Factors and Obstacles to Academic Achievement, Researcher's Journal, Higher School of Ms. Bouzareah, p. 10, p. 118.

Merah, Said (2016). Television and the Child's Academic Achievement: Dimensions of Influence and the Limits of Change, Al-Hikma Journal for Media and Communication Studies, Treasures of Wisdom for Publishing and Distribution, p. 8, p. 217.

Shiraz, Muhammad Saleh (2007): "The most prominent family factors affecting academic achievement," published research, Journal of Educational and Psychological Sciences, Volume (18), Issue 2, Baghdad.

Jarwan, Fathi Abdel Rahman (2013): Teaching Thinking, 8th edition, Dar Al-Fikr, Amman, Jordan.

Abdel Aziz, Saeed (2009): Teaching thinking and its skills, training and practical skills, House of Culture, Amman, Jordan.

Asfour, Iman Hassanein (2011): A program based on lateral thinking strategies and developing generative thinking skills and self-efficacy for female student teachers in the Philosophy and Sociology Department. Reading and Knowledge Magazine, Part Two. (177).