Research Article

The Effectiveness of Using Orielly Strategy in Critical Thinking Skills For Students of Primary Sixth class

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Abstract

The aim of the current research is to identify the effectiveness of using Orielly strategy in the critical thinking skills for students of primary sixth class. To verify the goal of the research, the null hypothesis was established, that there is no statistically significant difference at a significance level of (0.05) between the average scores of the experimental group students who were taught according to Orielly strategy, and the average scores of the students of the control group who were taught according to the ordinary method, of testing critical thinking skills.

The research was limited to sixth primary students, the first semester of the academic year 2020 – 2021 , and to the third, fourth and fifth chapters of the mathematics textbook. Four classes were randomly selected in each of them (15) students to represent the two classes (C, D) of the experimental group, and (A, B) the control group. The total number of the students was (30). The two research groups were rewarded in the variables (previous achievement, previous knowledge test, IQ test, chronological age calculated in months, their parents' academic achievement). (131) behavioral goals were formulated for the three chapters and for the three levels of Bloom's cognitive levels (knowledge, understanding, application). (42) Studies plans were prepared. A test for critical thinking skills (knowledge of assumptions, interpretation, argument evaluation, deduction, conclusion) consisting of (34) paragraphs was prepared. The difficulty coefficient, discriminatory strength, and effectiveness of the wrong alternatives were calculated. The test was applied, and the results of the research indicated that there was a statistically significant difference at a level of significance (0.05), between the average scores of the two groups (experimental and control), in favor of the experimental group in the test of critical thinking skills. This indicates the effectiveness of OReilly strategy in the critical thinking skills of students of sixth class . A number of recommendations were made, including introducing mathematics teachers to modern learning strategies, especially Oreilly strategy for teaching mathematics, and not being limited to traditional methods, to adopt Oreilly strategy in teaching mathematics to the students of sixth class, due to its useful and the effective advantages in critical thinking skills for the students.

The research suggested conducting a study to compare the education using Orielly strategy with other teaching methods, other study subjects, different levels of study, and other dependent variables (types of thinking, multiple intelligences ...)

Key words: Effectiveness, Orielly Strategy, Critical Thinking Skills For Primary Sixth class .

Chapter 1

First: the research problem:

Teaching mathematics for the primary stage requires to use instructional strategies that present the content of the scientific material in a clear, easy and simple manner equal to the mental abilities of the students, this requires taking into account the individual differences among students, the development of their mental abilities, and to link the theoretical aspect with the practical aspect with the available school capabilities.

Teaching mathematics has witnessed many shortcomings due to the lack of interest in using modern teaching methods and strategies on one hand, and the large number of students in the school class on the other hand, despite the relentless efforts done by teachers. BY surveying the views of (22) teachers who taught mathematics for students of sixth class, about the most important reasons leading to this decline and weakness in thinking styles in general, it was noted that there are many direct and indirect reasons behind this weakness, including the teaching methods used by some teachers are ineffective and not matching the content of the curriculum, in addition to the weak level of teachers' efficiency and their lack of enrollment in courses that qualify them to use modern teaching methods, which have overstressed on making the student the center of the educational process and this is what the

study carried out by (Hamza, 2019) indicated. The aforementioned study emphasized the weakness of encouraging and motivating students to think, because teachers do not use teaching methods that depend on thinking by the student in the first degree (Hamzah, 2019: 3). Also, the students' lack of interest in using thinking as a starting point for solving many mathematical problems and other problems that they face in their daily lives. The students aim is to reach success and cross over to the other class regardless of the achievement of their goals. According to what was mentioned above, the problem of the current research has evolved, in an attempt to search for modern methods and strategies that make the student more active and effective in the lesson in proportion to his mental abilities and his own potentials. It was an attempt to answer the following question;

What is the effectiveness of using the Orielly strategy in the critical thinking skills of primary sixth class students?

Second: The importance of research

The tremendous advances in science and the accompanying cognitive development make it difficult to provide learners with information by providing them with ready-made templates of information, which is very dangerous causing an obstacle to them to use their mental abilities properly (Khalili & others. 1995, 55-56). Many educators have explained the need to pay attention to learning strategies to develop critical thinking and developing its skills, which is important for the learner (Saadeh 2009: 100)

(Al-Kubaisi, 2009) pointed out the inability of teaching methods used at the present time to achieve the goal of critical thinking among learners. (AL-Kubaisi, 2009: 245).

The important role of the curriculum comes in helping to develop thinking and its skills.

The students are taught and trained to organize and sequence their thinking in order to be able to apply what they have learned in various situations inside and outside the school (AL-Zuhairi, 2006: 215).

Learning strategies have a great role in focusing attention and providing motivation. It has become necessary for teaching and learning strategies to be included in the teaching process in all school subjects, and for the learner to master the skills of those strategies and adequate training on how to apply them (AL-Suroor, 1998: 174). One of these strategies is Orielly strategy. To determine the evidence and evaluate it, where this strategy was proposed by Kevin OReilly, who saw that the first step that makes the learner thinker and critical is to be skeptical and until the teacher provides an opinion on something that seems convincing at first glance, and that learners believe in it as well, as they must be taught the skill steps as if they are athletes, who are guided when they first use it and repeat training on it in order to master it, (Habib, 2003: 55).

Critical thinking is also one of the most effective types of thinking because its processes do not stop at recalling information or ideas from memory only, but rather go beyond finding the relationship between various ideas and linking causes and reasons, and between results and events, analyzing and synthesizing ideas. It is not limited to a specific field, but to all situations of life. (Adas and Touq, 1998: 187). Accordingly, the researchers believe that critical thinking is a fundamental pillar in constructive education, especially in the last classes of the primary stage (sixth class of primary school) because most mathematics subjects constitute mathematical problems that require thinking of solving them.

Based on what has been mentioned, the importance of conducting this research is highlighted by:

1- The importance of using modern teaching strategies in addressing the poor achievement of students in mathematics, including the Orielly strategy, which is a modern strategy in teaching mathematics that emphasizes the use of critical thinking skills in receiving information and mathematical skills.

2- The importance of the sixth class of primary school is due to the passing to another stage and therefore students must possess a set of skills necessary for the next stage.

Third: Research limits

The research was limited to:

1- Sixth class students of primary school in the State Directorate of Education in Baghdad, Rusafa/ 1.

2- Mathematics textbook for the sixth class of primary school 8th edition, published in 2019, for the academic year (2020-2021).

Fourth: Research Objective

The current research aims to identify the effectiveness of using the OReilly strategy in the critical thinking skills of primary sixth-class students in mathematics. **Fifth: The research hypothesis**

To achieve the aim of the research, the following null hypothesis was developed: there is no statistically significant difference at a level of significance (0.05) between the average scores of the experimental group students, taught according to Orielly strategy, and the average scores of the control group students , taught according to the ordinary method, of testing skills of critical thinking .

Sixth: Terms Definition

1- Effectiveness: defined by each of:

• (Zaitoun, 2005) Getting the satisfactory result without wasting time and energy (Zaitoun, 2005: 63)

- (Tawfiq, 1997) as determining the desired effect of educating and training learners to achieve the set goals, and is measured by identifying the increase or decrease in their average scores. (Tawfiq, 1997: 93). **2- Strategy: defined by;**
- (AL-Haila, 2003), a set of procedures that include means that lead to achieving the desired goal or that it is a plan directed towards a specific goal. (AL-Haila, 2003: 77)
- (Attia, 2008), as the plan of progress that leads to the goal and includes the basic steps that the teacher planned for the purpose of achieving the goals of the curriculum. (Attia, 2008: 30).

3- Orielly strategy: it was defined by

- (Habib, 2003), as a strategy by which an individual becomes a critical thinker when he is constantly alert. To deepen this trend, teachers can present a convincing discussion of a topic revolving around something students believe and then show weaknesses in the discussion. (Habib, 2003: 22)
- (Abu Jadu and Nofal, 2007): It is a strategy proposed by educator Kevin OReilly who saw that the first step in this strategy is to make the individual think critically, to make him/ her doubtful about what he/she reads or hears, and for students to become skilled in critical thinking, they must train on steps of critical thinking skills, and working to repeat these steps until they are mastered by the learners. Orielly chose the skill of identifying and evaluating evidence to clarify and explain his strategy. (Abu Jadu & Nofal, 2007: 260).

4- Critical thinking: defined by each of (AL-Atoum &others 2011):

As "Contemplative thinking is governed by the rules of logic and analysis, and it is the product of cognitive aspects such as (knowledge of assumptions, evaluation of discussions, interpretation, conclusion, and deduction). Critical thinking is an evaluation process based on the rules of logical inference in its dealing with variables, and it is considered a mental process composed of skills and tendencies." . (AL-Atoum &others, 2011: 73).

Facione (2010), defined it as a self-organized and purposeful judgment, and this process takes into account the evidence, contexts, perceptions, methods, and standards. (Facione, 2010: 18). **Seventh: theoretical background and previous studies** Theoretical background:

• Constructivism theory: Constructivism

The constructivist theory is based on the principle that the learning process is an active process and that the learner's role is not completely passive, but rather plays a major role in the learning process as learning is based on what the student carries from previous experiences and that the learning process here is by reformulating previous concepts and experiences in the learner's mind . (Olive, 2003: 381)

(Khalil Radwan and Abdul Razzaq Sweilam, 2001) indicated that constructivism theory is a way to help learners build their scientific concepts and knowledge according to four stages, namely the call stage, the exploration stage, the stage of proposing solutions and interpretations, and the stage of taking action.

(Khalil Radwan and Abdul Rahman Sweilem, 2001: 111)

As explained (Abd al-Salam Mustafa, 1995) that constructivist theory is an instructional strategy based on meaningful learning that provides the opportunity for the learner to use his/her information and knowledge in building the new knowledge that he/she is convinced of. (Abd al-Salam Mustafa, 1995: 119)

In the light of what has been mentioned , it can be said that the constructivist theory is a teaching theory based on the principles of constructive learning according to four basic stages (the stage of advocacy, the exploration stage, the stage of proposing solutions and explanations, and the stage of taking action), through which the student performs a series of various educational activities using his/her own mental capabilities. The learner's previous knowledge, adds meaning and importance to his/her learning and helps to develop various kinds of thinking for him or her, and the teacher's role in it is to focus on stimulating, facilitating and directing the learning process.

Stages of constructive learning:

1 - The call stage: it is intended for the teacher to attract the learners' attention to what he/she wants to present to them

2 - The stage of exploration, discovery and innovation: This stage comes after the previous stage in which the teacher had posed a problem to the learners.

3 - The stage of proposing explanations and solutions: This stage depends mainly on the learners, as they present what have been reached in terms of interpretation, solutions and proposals.

4 - The stage of taking action: In this stage, learners apply what have been reached in terms of proposals, results, and interpretations. (Abdul-Amir and Dareea, 2019: 18) (AL-Kubaisi and Hassoun, 2014: 89).

It can be seen that after a clear vision has been defined about the constructivist theory (constructive learning) and how to use it in teaching, it is one of the most appropriate theories from which a group of strategies emerged, including the strategy of Orielly, as the learner under it poses questions and searches for answers to various

problems, and in order to use Orielly strategy in achievement and critical thinking among learners, a clear view about Orielly strategy must be provided to the learners , its achievement, critical thinking and its various skills.
Orielly strategy: This strategy was proposed by (kevin Oreilly) and it is one of the strategies for teaching critical thinking, as OReilly believes that historians of events do not agree to a large degree in their views about characters and incidents that occur in a limited period of time, and their discussion constitutes an effective direction. In developing critical thinking skills, many discussions took place between them when analyzing and evaluating historical issues (Asfour, 1994: 26).
From what has been mentioned above, we can identify the first steps of the Orielly strategy in;
1 - Make the individual think critically
2 - Make him/her skeptical about what he/she is reading or listening to.
3 - Encouraging students to train in critical thinking skills in order to become skilled in critical thinking and work to repeat these steps until they are properly mastered.

Concept of Orielly strategy: it is philosophy based on the idea that people perceive problems and issues from a different perspective. Thus, Orielly believes, "People do not agree on how much money should be spent on welfare programming in the United States, about fighting crime, or about the best candidate for elections." They all have different background frameworks of reference, choose different information and then evaluate it (Orielly, 2006).
The aim of Orielly strategy:
Orielly asserts that the primary aim of teaching using this strategy is to develop research skills and examine the events and problems for students on an analytical basis so that students can see these events and interpret them in a clear way, and then contribute to giving a clear picture of the events to take the appropriate decision. (Orielly, 2006)

Critical thinking:
The concept of critical thinking
With an in-depth review of the definitions of critical thinking contained in the literature on psychological and educational literature, we find the availability of many definitions for this type of thinking, which in turn covered multiple aspects of its different skills, and provided a clear picture of the characteristics of individuals who are characterized by critical thinking. This multiplicity and diversity of definitions indicates the differences in the visions and theoretical perspectives of researchers and theorists in this field. Critical thinking is one of the most complex forms of thinking, due to its relation to many behaviors such as logic and problem solving, and it is closely related to abstract thinking and reflective thinking. In this context, both (Abu Jadu and Nofal, 2007) point out that critical thinking is not a linear process, or step by step, as the individual in critical thinking provides a logical understanding of the evidence and context, theories, methods and standards. With the aim of reaching the formation of meaningful rule (Abu Jadu, and Nofal, 2007: 2).

Facione summed up the concept of critical thinking as purposeful, self-organized judgment, and the cognitive engine that leads to problem-solving and decision-making, (Facione 2010: 20).
Components of critical thinking:
- Defining assumptions
It is represented in examining the facts and data contained in any situation with the aim of determining the facts related to that position and excluding the assumptions that are not mentioned or related to it.
Interpretation: It consists in evaluating facts or assumptions related to the situation and drawing conclusions. -
Evaluating the arguments: They are represented in assessing the facts or assumptions related to the position and identifying the strengths and weaknesses therein.
- Extrapolation: It is represented by identifying the relationships between the situation and other situations and benefiting from previous knowledge of those situations in dealing with the new situation. It also includes judging through this knowledge of the facts derived from or associated with that position.
Conclusion: It is represented in the ability to distinguish between degrees of acceptance or non-acceptance of correctness or error of results according to the extent of their relevance to the facts related to the situation. (Watson-Glasser, 1964: 120).
Critical thinking skills:
Five Skills (Watson - Glasser, 1964) included a list of;
1 - Knowing the assumptions or axioms. 2 - Evaluating the arguments. 3- Interpretation.
4- Logical reasoning (deduction). 5- Conclusion. (Watson-Glasser, 1964: 120).
The relationship of critical thinking with mathematics:
One of the important aims that the teaching of mathematics seeks to achieve is the development of critical thinking to form a critical mentality to face problems and find sound logical solutions, after the era witnessed the development of information in addition to the successive changes, which necessitates searching for strategies and

models that will contribute to this growth. This critical mentality, which depends mainly on the method of deduction, data collection, comparison and contrast, knowledge of prioritization, and reaching knowledge of causes and consequences. The mathematics content includes cognitive experiences, laws and principles that develop critical thinking skills, which helps students to make sound logical judgments on various problems, and through mathematics, critical thinking skills can be developed, because it includes purely mental skills that the learner performs quickly and accurately from deduction, extrapolation, priority setting and classification, distinction, and interpretation. . (Barham and Al-Khatib, 2012).

Critical thinking strategies:

1 - Smith's strategy for assessing information validity.

2 - Inferential strategy for developing critical thinking skills (Bayer).

3 - Orielliy strategy and its relationship to critical thinking.

4 - (Munro & Slater) Critical Thinking Strategy.

Orielly strategy skills. Orielly asserts that the critical thinker analyzes and evaluates the following indications; 1- Analytical skills 2- Evaluation skills (Orielly, 2006).

Previous studies

Studies on Orielly Strategy:

1- (Afles, 2014) aimed to measure the effectiveness of a proposed teaching program in accordance with OReilly strategy in achievement and the trend towards the subject of national education among a sample of first-class secondary students in the subjects of national education among students of tenth class, and their attitudes towards it. An experimental study in Damascus Governorate.

2 - (Muntaha, 2019), the study aimed to identify the effectiveness of the Polia and OReilly strategies in achievement and to develop the skill of evaluating arguments in science for students of intermediate secondclass.

Particular studies on critical thinking skills:

1 - (AL- Khuzam, 1998) the study was conducted in Jordan, it aimed to identify the effect of three methods of teaching on the development of critical thinking among tenth class students in basic mathematics. (Al-Khuzam, 1998)

2 - (AL - Qaisi, 2001) the study was conducted in Iraq, it aimed to identify the effect of concept maps on primary school students' achievement and their critical thinking in mathematics. (Al-Qaisi, 2001)

3 - (AL - Azzawi, 2002) the study was conducted in Iraq, aimed to find out the effect of a training program for mathematics teachers on questioning strategies on the critical thinking skills of their students, (Al-Azzawi, 2002).

Eighth: Research methodology and procedures:

1- Determining the research community and selecting its sample:

The current research community is represented by the sixth – class students of primary school, in the schools affiliated to the State Directorate of Education in Baghdad Governorate, Rusafa / 1, for the students who study mathematics in the academic year 2020 – 2021. After the school being chosen, (Fajr Al-Islam) school, and before starting the experiment, the researchers pay a visit to the school to agree with the administration and the teacher of the mathematics subject to facilitate the task of conducting the experiment. The researchers found that the school includes (6) classrooms in the sixth stage of primary school and by using the simple random selecting method, the two classes (C, D) were chosen to represent the experimental group, that was taught mathematics according to OReilly strategy and the two other classes (A, B) to represent the control group, that was taught mathematics according to the ordinary method of teaching. The number of the research sample was (60) students. No student was excluded from the experiment due to their success, so that the number of the sample remains (60) students, (30) students for the experimental group (C, D) and (30) students for the control group (A, B).

2- Experimental design:

A semi - experimental design was adopted for the two equivalent groups with a post-test, it is one of the designs with partial control , chosen on the basis of achieving the research goal.

3- Equivalence of the two research groups:

- Examining the previous information:

Repeat a test consisting of (20) items of a multiple choice type. The items of the test were presented to a group of specialists and experts, the test was applied to the students of the two groups (experimental and control). The researchers found that there was no statistically significant difference with a level of (0.05) and a degree of freedom (58) as the tabular value was equal to (2), which is greater than the calculated value (1,638), indicating that the two research groups are equivalent in the previous information variables.

Mathematics scores in the fifth class of primary school:

To verify the parity of the two groups (experimental and control) in previous achievement in mathematics for the academic year 2019-2020, the scores of students in the fifth class of primary school were used from the records of students in the school administration and after applying the T-test for the two samples Independent and equal to know the significance of the statistical difference between the average scores of the two research groups (experimental and control), It was found that the tabular value equal to (2) is greater than the calculated value of (1.13) at the level of (0.05) and the degree of freedom was (58), which indicates the statistical equivalence of the two research groups in the achievement variable in mathematics for the previous year.

Chronological age in months:

To find out the significance of the statistical difference between the average scores of the two groups (experimental and control), it was concluded that the difference is not statistically significant at the level of (0.05) and that the tabular value of (T-test) is equal to (2), which is greater than its calculated value (0.4710) at the level of (0.05) and degree of freedom was (58), indicating that the two research groups (experimental and control) are statistically equivalent in age.

Parents' academic level:

Using (Chi-square) to test the difference between the two groups (experimental and control) in the educational level of the parents, the results showed that there was no statistically significant difference at the level of (0.05), indicating that the two groups are equal in this variable.

Intelligence questions test:

Raven test was applied to standardized matrices for the Iraqi environment, prepared by AL -Dabbagh and others, there was no statistically significant difference, as the calculated T value was (0.0601), which is less than the tabular value (2) at the level of (0.05) and the degree of freedom (58), which means equalization of the two research groups in the variable of intelligence questions.

4- External safety of the experimental design:

- **Teaching environment for the classroom:**

The experiment was conducted in the same environment in terms of the number of classrooms of equal size and lighting.

- **Experimental extinction:**

The researcher did not encounter a problem with this variable, as absences did not occur in the two groups except in a small percentage and in an equal manner.

- **Measurement tool:**

The same measurement tool (Critical Thinking Test) was used for the experimental and control groups.

- **Selection of the sample members:**

Classes (C, D) was chosen for the experimental group and (A, B) for the control group.

- **The effect of experimental procedures:**

The experiment was conducted in complete secrecy, the students were informed that one of the researchers is a new teacher, the two groups were taught the same scientific material, one of the researchers taught the two groups to ensure the teacher's personal characteristics and the methods used, using the same educational methods, the same place and time for the experiment.

5- Research Requirements:

- **Determining the content:**

The content of the scientific material was determined in the three chapters (third, fourth and fifth) of the sixthclass mathematics textbook , 9th edition, for the academic year 2020-2021.

Preparation of teaching plans:

(42) Study plans were prepared that covered the contents of the third, fourth and fifth chapters.

Formulation of behavioral goals:

(131) behavioral objectives were formulated for the three chapters and for the three levels of Bloom's cognitive domain (knowledge, understanding, and application).

6- The research tool:

The research tool was to test critical thinking.

Ninth: Presentation and interpretation of results:

After applying the critical thinking test for the experimental and control groups and extracting the arithmetic mediator of the scores of each group with its standard deviation, T-test was used and the results were as in the following table:

The arithmetic mediator, standard deviation, and T-value (calculated and tabular)
For students of the two groups (experimental and control) in the post-critical thinking test

Groups	Size of sample	arithmetic mediator	Standard deviation	Freedom degree	T – value		Significance level
Experimental group	**30**	**28.50**	**2.42**	**58**	**Counted**	**Tabular**	**Statistically Significant**
Control group	**30**	**20.57**	**1.98**		**13.91**	**2.000**	

The results showed that there is a statistically significant difference in the achievement of the students of the two groups (experimental and control), in favor of the experimental group students who were taught according to the Oreilly strategy at a significance level of (0.05) in the test of critical thinking. Tenth:

Conclusions:

1 - The research confirmed that the use of Oreilly strategy in teaching sixth class students contributes to encouraging students to think critically and deepens their understanding and comprehension of mathematics, compared to the usual method of teaching.

2- Teaching using the Oreilly strategy encourages students to be free to ask questions and to participate positively during the lesson.

3 - Oreilly strategy increases the student's self-confidence, and encourages interaction between the teacher and the students.

Eleventh:

Recommendations

1- Adopting the Oreilly strategy in teaching mathematics for students of sixth primary class due to its useful advantages, and effectiveness in the participation of the students and their critical thinking.

2- To have mathematics teachers introduced to modern learning strategies, including the Oreilly strategy for teaching mathematics, not being limited to traditional methods.

Fourth: suggestions

1- Conducting a study to compare teaching by Oreilly strategy with other teaching methods, for other stages and other study materials.

2- Conducting similar research on other educational stages, on both males and females to find out the effect of using Oreilly's strategy on students' achievement, compared to the ordinary method of teaching or any other method.

3 - Conducting an experimental study of the effectiveness of using Oriley strategy on other dependent variables (attitude, thinking of all kinds and multiple intelligences).

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