

The effect of the active reading strategy for teaching biology to second-grade intermediate students in their imaginative thinking skills

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Abstract

The aim of the current research is to identify the effect of the active reading strategy in teaching biology to second-grade intermediate students on their imaginative thinking skills.

The two researchers adopted the experimental design with partial control to achieve the goal of the research, and the current research community identified with second-grade students in the intermediate government schools of the Baghdad Education Directorate / Al-Resafa /1 for the academic year (2021-2022 AD), and Al Safina Intermediate School for Girls was chosen to be the second-grade students, to be research sample in intentionally, two divisions were randomly selected from a total of four divisions to be one of them experimental and the other control, the research sample amounted to (71) female students, with (36) female students in the experimental group and (35) female students in the control group, valence was made between the two research groups (experimental and control). in the variables (intelligence test, chronological age, previous biological information test, imaginative thinking skills test), the teaching plans were prepared for the two groups, the first researcher taught the two research groups herself during the ten-week trial period of the first academic course for the academic year (2021-2022 AD). The two researchers prepared a test for imaginative thinking skills consisting of (12) essay items, divided into four skills, meaning that each skill has three test items. The validity of the two research tools was verified by presenting them to a group of arbitrators, and their psychometric properties.

After completing the experiment, the tool was applied to the two research groups, then the students' answers were corrected, and they were processed statistically, as the following results showed: There is a statistically significant difference between the scores average of the two research groups in favor of the experimental group in testing imaginative thinking skills. The research results indicated a positive effect of teaching with the effective reading strategy. in imaginative thinking skills, and in light of this, the two researchers presented a number of recommendations and suggestions.

First: Problem of the Research

The current era is witnessing a rapid development in various fields of life, due to the information and technical revolution, so there are difficulties faced by students, including the teaching methods used by teachers in biology, although the emergence of different educational models in teaching some subjects as educational applications of educational theories, took its way of experimentation and application in educational and learning institutions, and the lack of interest of biology teachers in the modern educational methods, in teaching biology and its concepts, with their weak knowledge of them, which leads them to pay attention to the use of ordinary methods, with finding a need to improve these methods and ways used in teaching, it does not help to develop thinking skills in general, and given the poor effectiveness of teaching, the two researchers called for a discussion with teachers of biology, as they noticed that there is a lack of focus and that students tend to memorize automatically and tend to memorize facts and information sufficiently, and from the above it is clear that there are shortcomings in the educational process and that the normal teaching methods are no longer able to play their role in the delivery of the educational material, therefore, the two researchers see that it is important to apply a modern strategy, the active reading, in teaching biology to second-intermediate students, to know its impact on their imaginative thinking skills, and based on the foregoing, we summarize the contents of the research problem as follows;

-What is the effect of the active reading strategy for teaching second intermediate students in biology on their imaginative thinking skills?

Second: Importance of Research

Education is the society's means to maintain its survival and stability of its system, social standards and knowledge of previous generations. (Al-Sayed, 2004, 37) The Active Reading Strategy(SQ3R) is one of the most important metacognitive strategies in learning to read, as it may lead to steps in which students interact with the subject matter of the lesson, which results in achieving high levels of understanding and that it develops the student's ability to rely on himself in the process of learning. Some believe that this strategy is suitable for most academic subjects such as sciences and arts, and is not suitable for reading

digital subjects such as mathematics and statistics. The steps of this strategy lead to a good reading comprehension, which helps to overcome academic difficulties, and thus helps to develop students' thinking. (Al-Saadi, 2020, 229) Training students on imaginative thinking skills generates an enjoyable and motivating experience, as the learner can transcend material limits through his mind and project himself on something and explore what helps him in solving his own problems and in creative ways. (Al-Saadi, 2020, 21) From the above, the importance of the research can be summarized as follows;

- 1-Knowing the effect of the active reading strategy on the imaginative thinking skills of second-grade intermediate students.

- 2-Providing a test for imaginative thinking skills to measure the imaginative thinking skills of second-grade intermediate students.

Third: Aims of the Research

The research aims to identify the effect of the active reading strategy for teaching biology for second-grade intermediate students on their imaginative thinking skills.

Fourth: Hypothesis of the Research

There is no statistically significant difference at the level (0.05) in the scores average of the students of the first experimental group who study according to the active reading strategy, and the students of the control group who study according to the usual method in their imaginative thinking.

Fifth: Limitations of the Research

1-Human limits: the second intermediate school students in the governmental intermediate schools affiliated to the schools of Baghdad education , Al-Resafa /1

2-Cognitive limits: the academic content of biology within the established vocabulary in the science subject taught in the first semester, which are (Chapter Seven, Simple Organisms, Chapter Eight, The Kingdom of Plants, Chapter Nine The Kingdom of Animals, Chapter Ten Environment and Its Components)

3-Time limits: The first course of the 2021-2022 school year

4-Spatial limits: the General Directorate of Education, Baghdad, Resafa/1

Sixth: Defining Terms:

1-Effect

Al-Saadoun 2012: The amount of change intended to occur in the dependent variable due to the influence of the independent variable on it" (Al-Saadoun, 2012, 22)

Procedural definition: It is the ability of the active reading strategy to make a change in the achievement and imaginative thinking skills of the second-grade intermediate students of biology.

2-Active Reading Strategy

Ghayyad and Al-Shanjar (2018): It is one of the basic strategies in developing comprehension skills and memorizing the educational material, and increases the focus on reading to achieve total comprehension, activate self-education, and activate the role of students due to its importance in the learning process. (Ghayyad and Al-Shanjar, 2018, 43)

The two researchers define it procedurally, It is a set of reading instructional steps that are taught to the students of the experimental group in its five steps of the science book for the second intermediate class in biology, as these steps lead to the participation and interaction of students for the purpose of achievement and reaching a more understanding of the subject.

3-Imaginative Thinking

It was defined as follow;

Al-Tayeb (2006): It is a mental process through which the processes of synthesis and integration occur between the components of memory and the mental images that were formed before from past experiences, and the results of all of this are new forms. (Al-Tayyib, 2006, 181)

Al-Shammari (2021): It is the students' way of seeing things in a new and innovative way, examining and investigating imagination, generating imaginary possibilities and alternatives, inferring the (imaginative) mental image and imaginative mental transformations, and producing imaginary mental images. (Al-Shammari, 2021, 11)

Procedural definition: It is a mental activity that occurs in the second-grade intermediate students by forming an image of a situation with the help of previous experiences, and it is measured by the total score obtained by the student by answering the test items for the imaginative thinking skills prepared for the current research.

Seventh: Theoretical Research Background

1-Metacognitive Strategies

The historical roots of the concept of metacognition: This concept of metacognition appeared in the seventies of the last century to add a new dimension to the issues of memory, comprehension and learning skills, and interest in this concept developed in the eighties due to its connection with learning theories, problem solving strategy and decision-making. (Atiya, 2014, 138)

It is clear that metacognition is thinking about thinking and knowing about knowledge, meaning understanding thinking processes, observing them, controlling them, and regulating them, especially the processes that the individual uses while he learns in various situations and is aware of what he is practicing. (Al-Salami, 2012, 13)

It can be defined in a way that combines the most important elements referred to: They are complex mental skills that are among the most important components of intelligent behavior in processing information and carry out the task of controlling working thinking activities directed at solving a problem and using cognitive abilities effectively, and they grow with age and experience. (Al-Afoun, 2013, 41)

The educational significance of metacognitive strategies

The modern view of learning includes three postulates as follow;

- 1-Learning is the process of constructing knowledge and not merely receiving it or assimilate it ready-made.
- 2-Learning is a process that depends on the employment of knowledge, as previous knowledge is adopted in building new knowledge.
- 3- The student is aware of the cognitive processes and can control them and effectively influence what he learns (Al-Saeed, 2001, 20)

Active reading strategy SQ3R

The SQ3R strategy is the effective reading strategy, as reading is focused, and it is one of the organized strategies, which was developed to help students read books and scientific texts in an effective way. The author of this strategy was Francis Robinson (1946) of Ohio State University. This strategy gained fame not only for the scientific principles on which it is based, but also for the name or symbol chosen for it, which makes it easy to remember its five steps. (Mahdi, 2019, 208)

It is called the Robinson strategy after Francis Robinson, and he is the first to point out the importance of adopting it in teaching with most subjects, and all educational levels, especially advanced ones. The strategy is expressed in the first letters that pass through, as the students form an overview or introductory overview of the text materials and then write a set of expectations about the topic of the text, by asking some questions about the topic title, and then reading the text interactively and then searching for answers to these questions. (Abdullah, 2014, 105)

Preparing to teach active reading strategy (SQ3R)

- 1-The teacher gives the student a sheet of paper with a number of instructions, and then gives a model as an example to show how to respond to each set of questions or tasks.
- 2-The teacher selects a paragraph or part of the text to be read and divides the students into small cooperative groups, and sets a specific time for them to practice these strategic steps with support, guidance and appropriate feedback.
- 3- After making sure that they understand each step of the strategy, the teacher selects some additional parts for reading, the students should do this completely independently without any interference from the teacher.

(Abdullah, 2014, 150)

Steps to implement the active reading strategy (SQ3R)

The Active Reading Strategy SQ3R is one of the strategies that help students to facilitate gaining understanding and knowledge when practicing scientific reading. The strategy steps are as follows;

1-Survey/browsing : Students at this stage survey or scan the material to be read by taking a quick and comprehensive look at the reading text, including texts, drawings, and scientific forms in order to form a general idea of the material to be read and to know the most prominent information and concepts contained in the text.

2-Question: through which students formulate a set of questions about important scientific concepts, or new to them, based on the information and scientific concepts that have been surveyed, and the previous information they have, so that the students determine what they want to know from the subject, given that the reading is purposeful, effective and achieve specific goals.

3-Reading: Through which students re-read the text, including its scientific forms and drawings, thorough and deep reading, by providing them with enough time to be able to focus during active reading and answer the questions they raised in the previous step.

4-Recite: In this step, the students retrieve the information by going back to reading the questions that were asked in the second step with their answers in order to retrieve the information and verify the comprehension of the topic, as it enables the students to assess their comprehension of the self-read topic.

5-Review: Students review the reading content to form a clear image of it and thus realize the overall content to assess the extent to which they have comprehended the content of the text with a return to reading the text again based on performance in the review. Ambo Saidi, 2018, 603)

2-Imaginative Thinking

Imagination is one of the processes of the higher mentality, and it is a fundamental purpose for teaching thinking, imagination helps to organized thinking, through it, the teacher can test ideas about learning and evaluate its teaching, and the goals it achieves. and educational magazines. Students imagine when they are trying to solve a problem of their own or a problem in their environment, as they imagine what will happen, what can and cannot be achieved, and the consequences of that, and the creative work that scientists do depends on their abilities to imagine and use thinking, and that scientists often reach conclusions that prove their validity without resorting to explaining the logical foundations on which these conclusions are based because they relied on their imagination abilities. (Lavi, 2000, 83)

Imaginative thinking is a mental process through which installation processes occur and a combination of memory components and mental images formed through past experiences, and the results of all of this are new forms. (Al-Tayyib, 2006, 181)

Imaginative Thinking Theories

There are a number of theories that have attempted to explain imagination, the most important of which are;

1-Theory of the robot or mechanic (1940)

2-Binary Coding Theory (1970)

3-Theory of information retrieval of the mind and senses (1987)

The researchers adopted this theory of binary double coding

Dual coding theory . (1970)

The author of this theory Baivio: It is also known as double representation, as he indicated that information is stored in long-term memory according to two interconnected and complex systems, but they are independent at the same time, as the first system known as linguistic or verbal coding is an examination of the processing and representation of verbal information and arranged according to specific sequence ,the binary system is known as imaginary encoding and is specialized in representing spatial information. (Al-Saadi, 2020, 47)

Factors affecting imaginative thinking

1-Intelligence: Many researches and studies have confirmed that there is a relationship between imagination and intelligence, meaning that the intelligence factor helps the effectiveness of imagination.

2-Chronological age: It has been proven that there is a positive relationship between chronological age and imagination,that is, the more the individual gets older, his imagination increases, and this thing is added to the factor of learning and experience.

3-Gender: Many studies have proven that there are differences in imagination according to gender for males and females, and there are studies that have proven that there are no differences according to the gender variable.

(Abd al-Rahman, 2016, 826) as mentioned in (Al-Kulabi, 2021, 48)

Imaginative thinking skills

Imagination skills require compatibility of both the mental cognitive side and the performance skill side, It uses remembering in retrieving mental images of the various engineering drawings that the students studied, it is a type of thinking in which facts are used to solve engineering problems. It identified the imagination skills in two basic skills;

-Reading engineering drawings (flat, regular and compound

Expressing geometric shapes by drawing (flat, regular, and compound)-

Ahmed Abdel Aziz, 2001, 31) as mentioned in (Abbas, 2013 203)

Abbas (2013) identified a number of imaginative thinking skills, which are;

1-Visualizing or imagining something through drawing, verbal or written description

2-Create a mental representation or mental image of this thing.

3-Perform mental transformations on this representation (such as rotation, displacement, reflection, deletion, addition, division, assembling)

4-Using the form that has been reached to solve the problem facing the individual, and imagined images may be used to serve some other mental processes such as deduction and innovation.

5-A way of describing and expressing what he found (Abbas, 2013, 204)

As for Mahmoud (2015), he identified a number of imaginative thinking skills, which are;

1-The skill of mental image retrieval.

It means the activity that students do with the aim of storing information in memory, retaining it and retrieving it again.

2-Mental transformation skills: It means making adjustments to the mental representation of things (deletion, addition, grouping, rotation, displacement, reflection)

3-Recombination skill: It is intended to reconstruct the elements of mental images to produce new unrealistic meanings (Mahmoud, 2015,9)

Al-Shammari (2021) mentioned a number of imaginative thinking skills;

1-A way of seeing things in a new and innovative way

2-Examination and investigation of imagination (method of making links)

3-Generating imaginary possibilities and alternatives

4- Inferring the imaginary mental image

5-Imaginative mental shifts

6-Producing imaginary mental images

Through the previous presentation of the skills, the two researchers adopted a set of imaginative thinking skills in proportion to the characteristics of the target group in the research as follows;

1-The first skill: a way to see things in a new and innovative way: its concept is the students' way of reconsidering and imagining things and things around it in a way that enables them to reach a new production and look at things from several angles, seeing the shortcomings and defects in things, producing a number of ideas and visions and synthesizing things to create new ideas .

Second skill: Examination and investigation of imagination (a method of making connections): the method of students to determine the similarity and difference in the image using description, analysis, comparison and classification.

3-The third skill: generating imaginary possibilities and alternatives: creating formulations for imagination by retrieving and using previous information.

4-Fourth skill: Inference on the (imaginative) mental image Employing the imaginary mental image for scientific inference. (Al-Shammari, 2021, 61)

The importance of imaginative thinking skills in the educational process

1-It represents the heart of any educational experience

2-A center for all dimensions of curricula and all areas of effective thinking in general and imaginative and creative thinking in particular.

3-Life is given to any idea or subject

4-A necessary requirement to practice fruitful and effective educational activities.

5-Providing experiences that stimulate students' imaginations in educational situations.

6-To develop the mental activity of the students

7-Unleash ideas

8-Retrieve the information stored in memory and use it in new situations

(Al-Mansi, 2017: 58) as mentioned in (Al-Shammari, 2021, 55)

Eighth: Research methodology and procedures

1-Experimental design: The two researchers adopted one of these designs that is compatible with their research, which is one of the quasi-experimental designs for two equal groups (experimental group and control group) with post-test, as the experimental group will study according to the active reading strategy, while the control group will study according to the. normal method, as shown in the following diagram;

| The group | equivalence in a number of variables | independent variable | dependent variable | the measure of the dependent variable |
|------------------------------|--|---|--------------------------------|---------------------------------------|
| Experimental Experimental | chronological age in months- IQ test Examination of previous knowledge in biology | Active reading strategy Normal method | Imaginative Thinking Skills | Imaginative Thinking Skills Test |

Scheme (1)

Experimental design approved in the research.

2-The research community and its sample: The current research community was determined by second-grade students in government intermediate schools affiliated to the Baghdad Education Directorate / Al-Resafa /1 for the academic year (2021-2022 AD), and Al Safina Intermediate School for Girls was chosen to be the second-grade students of the research sample in an intentional way to apply the experiment in it, and its selection was (intentionally), due to the cooperation of the administration and teachers, as well as the students, all of them from a close environment, and the school consisted of four divisions (A, B, C, D),

and the people were randomly selected, division (C) to represent the experimental group that is taught according to the active reading strategy, as the number of female students in it is (36), and division (D) represents the control group that studies according to the normal method, as the number of students in it is (35) students. The students who failed were statistically excluded, numbering (1) students from each class (C, D)

2-The equivalence of the two research groups: Before starting the experiment and teaching, the two researchers conducted a statistical equivalence between the students of the experimental and control groups in a number of variables that they believe may affect the dependent variables with the independent variable, namely, the chronological age calculated in months, knowledge test, intelligence test, table below shows the equivalence results Table (1)

Table (1)

Arithmetic means and standard deviations of the experimental and control groups in the equivalence variables.

| Equivalence variables | Arithmetic mean | | Standard deviation | | t-test | | Significance at level 0.05 |
|-----------------------|--------------------|---------------|--------------------|---------------|------------|---------|----------------------------|
| | experimental group | control group | experimental group | control group | Calculated | Tabular | |
| Prior knowledge | 13.7059 | 14.3529 | 3.50350 | 2.901 | 0.829 | 002. | statistically significant |
| the age with month | 160.7353 | 161.0294 | 3.4929 | 3.8018 | 0.332 | 002. | statistically significant |
| Intelligence Test | 37.1176 | 37.1765 | 8.86178 | 8.39000 | 0.028 | 002. | statistically significant |

4-Defining the scientific subject: The four chapters of biology (Chapter Seven: Living Organisms, Chapter Eight: Plants, Chapter Nine: Animals, Chapter Ten: The Environment and Its Components) of biology in the

science textbook for second-grade intermediate students for the academic year (2021-2022) authored by Dawood and others, third edition of 2019, the Ministry of Education, the General Directorate of Curricula, as these chapters were determined based on the nature and duration of the permitted experiment.

5-Behavioral objectives and preparation of study plans: The two researchers formulated (170) behavioral objectives and relied on determining those objectives on the first four levels of classification (Bloom) in the cognitive domain (remember, comprehension, application, analysis) the two researchers presented a model of the teaching plans to the arbitrators and specialists in the methods of science, to know their opinions and suggestions in order to improve the formulation of those plans and put them in the right way, some modifications have been made to it in the light of the opinions, as it is ready to be applied to the sample of the experiment, and the number of these plans prepared by the two researchers has reached (24) plans.

6-Research tool: Determining the objective of the imaginative thinking skills: The objective of this test is to measure the level of imaginative thinking among second-grade students through the paragraphs prepared for this purpose.

1-Determining the skills of imaginative thinking

In order to formulate the paragraphs of the imaginative thinking test, the two researchers reviewed a number of tests related to this type of thinking, and determined its components and skills through standards and tests for different stages, and accordingly, the imaginative thinking skills were determined in their initial form, and it consisted of (4) skills and that determining the skills came in line with the nature of the current study, and the theoretical and procedural definitions that were relied upon.

Presenting skills to the arbitrators: After determining the skills of imaginative thinking in their initial form, they were presented to a group of arbitrators and specialists in the field of teaching methods of science and psychology in order to express their views on the validity of these skills for the purposes of the current study, and some modifications were made based on their opinions and observations, which these skills became ready to be finalized.

Formulation of test items: After the imaginative thinking skills were determined in its final form, the items of the imaginative thinking test were prepared in its initial form, which consists of (12) essay items, distributed over four skills, meaning that each skill has three test items.

These paragraphs were presented to arbitrators and specialists in the field of methods of teaching science, measurement and evaluation, in order to ensure the validity of each of the paragraphs in measuring the field to be measured, as well as to verify the apparent validity and suitability of the study sample, and they were approved by (80%) of the arbitrators and specialists, after some modifications were made to it, and

thus, the test is ready in order to be applied to the exploratory sample to measure the imaginative thinking variable

-Preparing test instructions

A. Answer instructions: In order to complete the initial form of the test, the instructions for it have been prepared and taken into account to clarify the purpose of the general test, how to answer and pay attention to the existing examples and not leave the paragraphs unanswered and write the solution for each paragraph below it.

B . Correction instructions: The two researchers relied on the correction process, as the grades for the essay paragraphs of each question were given the corresponding degree (1-2-4-6-7), according to the answer to the question and (zero) for the left or wrong answer, and thus the total score for the test is (35).) degree.

Survey application;

A. The first exploratory application : To find out the extent of the clarity of the test paragraphs and the extent of their understanding by the students and the time taken to answer them, as well as to ensure the clarity of the answer instructions, the two researchers applied the imaginative thinking test on an exploratory sample consisting of (30) female students from the second intermediate grade at the Shuhada' Jiser Al-Imaam School for girls affiliated with the General Directorate of Resafa Education / 1, where the application was implemented on Wednesday, 19/1/2022, and the time taken to answer was calculated by adopting the arithmetic mean for the answer of the sample students, by calculating (the first five and the last five students according to their number), so it was the average time between them is (25) minutes.

B. The second exploratory application: The two researchers applied the test to a second exploratory sample from the same research community, and the sample consisted of (100) female students of the second intermediate grade in the School (Intermediate Ibdāa school for Girls) of the General Directorate of Education Resafa / 1 in Baghdad, and the test was applied on one day Thursday, 20/1/2022, in order to conduct the appropriate statistical analyzes such as (calculating the strength of discrimination and the effectiveness of the wrong alternatives for its paragraphs)

-Statistical analysis of the test items: After correcting the responses based on the answers to the imaginative thinking test, the total score for each student on the test was determined.as their scores were arranged in descending order, and the scores that represented (27%) were taken from the (highest) and (27%) from the (lower) and then the coefficient of distinction and the effectiveness of the wrong alternatives for the paragraphs of the imaginative thinking test were calculated as follows;

1-Difficulty coefficient: The difficulty coefficient has been extracted using its equation for the essay test paragraphs, and it was found that it ranges between (0.67-0.48), which are good ratios as indicated by (Al-Kubaisi, 2007). If the ratio is (0.20-80), then it is considered good (Al-Kubaisi 2007;170)

2-Discrimination coefficient: The discrimination coefficient was extracted for each paragraph of the imaginative thinking test using the special equation for the discrimination coefficient for the article paragraphs, and it was found that it ranges between (0.34 - 0.66), as the sources for measurement and evaluation indicate that the discrimination coefficient represents a percentage (0.20). more than that, it is considered a good percentage (Allam, 2009: 254), this shows, so all paragraphs of the imaginative thinking test are considered acceptable in terms of their discriminatory ability, and no paragraph has been deleted from it.

Psychometric properties include;

A. Validity of the test

-Apparent validity: presenting the paragraphs of the speculative thinking test in its initial form to a number of arbitrators and specialists in the field of biology, methods of teaching them, measurement and evaluation, to take their opinions and observations, and to ensure that the test paragraphs measure the previously specified fields that received the approval of experts and specialists as well. Apparently valid to measure the imaginative thinking variable for the purposes of this research.

-Structured validity: construct validity refers to the degree to which a test measures a theoretical construct, a specific feature, or the ability of that test to verify the validity of a hypothesis (Al Kubaisi, 2010: 267)

Pearson's correlation coefficient was used and then the correlation coefficients were calculated.

B- Reliability

-Cronbach's alpha equation: The reliability of the imaginative thinking test was extracted by adopting the alpha Cronbach equation, which is suitable for both article paragraphs, which is an indicator of the internal homogeneity of the test paragraphs. It is good if its reliability coefficient is (0.70) or more (Al-Nabhan, 2004: 240), and thus it can be said that the special test of imaginative thinking for second-grade

intermediate students prepared by the two researchers for the purposes of this study is valid and has good reliability.

-Reliability of correction for article paragraphs: In order to verify the stability of correction for article paragraphs, (35) papers were randomly withdrawn by the two researchers from (the second exploratory application) and they corrected them again after (15 days) after the first correction, using the (cooper) equation, the percentage of agreement between the two corrections was (0.99), and using the same equation, the correction was repeated by another school, and the percentage reached (0.97) and it is considered an acceptable value. the correction coefficient for article items is (0.75) or more, it is considered good (Majid and Yassin, 2012: 93).

-Application of the test to the research sample: The imaginative thinking test was applied to the research sample (experimental and control groups) on Saturday 22/1/2022.

Statistical means: The following statistical methods were adopted in this research, whether in their procedures or in analyzing their results through the application of the SPSS Statistical Package for Social Sciences, version 23.

1-Discrimination equation (for objective items), alternatives effectiveness equation, difficulty coefficient equation (for objective items), Cronbach's alpha equation, Pearson correlation coefficient, t-test for two independent samples of unequal size, effect size equation.

Ninth: Presentation of the results: To verify the following research hypothesis;

There is no statistically significant difference at the level (0.05) between the average scores of the experimental group students who study according to the active reading strategy and the average scores of the control group students who study according to the normal method in imaginative thinking, science subject). The two researchers applied the imaginative thinking skills test on the students of the two groups, and extracted the scores of the students in both groups, and then the arithmetic mean and standard deviation were calculated, and the calculated and tabular T-value was extracted, Table (2)

| Group | Number | Arithmetic mean | Standard deviation | Degree of freedom | T-value | | Significance level 0.05 |
|--------------|--------|-----------------|--------------------|-------------------|------------|---------|-------------------------|
| | | | | | Calculated | tabular | |
| Experimental | 34 | 27.3235 | 38825 | 66 | 4.548 | 2,00 | Significant |
| Control | 34 | 22.1471 | 53831 | | | | |

Table (2)

The results of the t-test for the difference between the average scores of the two groups in the imaginative thinking skills test.

The results showed, as shown in Table (2), that the calculated T-value and its value (4.548), is greater than the tabular value whose value (2) is at the level (0.05) and the degree of freedom (66), and this means that there is a statistically significant difference between the average scores of testing the imaginative thinking skills of the students of the two groups, in favor of the experimental group, thus rejecting the null hypothesis and accepting the alternative hypothesis, and Figure (1) shows the averages of the two groups.

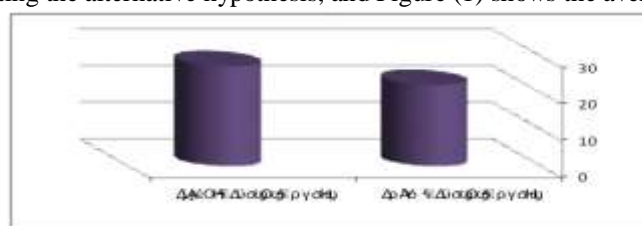


Figure (1) The averages of the two groups in the post-imaginative thinking test

In order to find out the effect size (d) of the independent variable (active reading strategy) on the dependent variable (imaginative thinking skills test), the two researchers found the value (η^2), as (η^2) expresses the percentage of total variance in the dependent variable (imaginative thinking test), which can be traced back to the independent variable (active reading strategy)

| independent variable | dependent variable | The value of η^2 | The value of d | The size of the effect |
|-------------------------|---------------------------------|-----------------------|----------------|------------------------|
| Active Reading Strategy | Imaginative Thinking SkillsTest | 0.2390 | 11.1208 | Very Large |

Table (3)

The effect of the independent variable on the dependent variable It is noticed from Table (3) that this means that the effect size is very large, which indicates that the independent variable (active reading

strategy) has an effect on the dependent variable (imaginative thinking test) with a large degree of effectiveness on the experimental group.

Interpretation of the results: The results in table (2) showed that there was a statistically significant difference between the scores of the two research groups (experimental and control) in the test of imaginative thinking skills in favor of the experimental group, table (3) shows that the size of the effect is very large, and this means that the students of the experimental group who studied according to the active reading strategy outperformed the students of the control group who studied according to the normal method. The two researchers can attribute the reason for this to;

1-The adoption of the active reading strategy in particular led to an increase in the students' awareness of their thinking levels and their own abilities in dealing with different educational situations, which increased their confidence and their attempt to modify their thinking patterns so that they could be made more and better used, as indicated by (Atiya 2014) and (Ambo Saidi 2018) it helps students to train students to be aware of themselves and know the processes that take place during the educational process and trains them to take responsibility for their learning. (Atiya, 2014, 157) (Ambo Saidi, 2018, 602)

2-The active reading strategy gave female students an educational space and gave them the opportunity to ask thought-provoking questions related to some of the concepts and problems presented in the class, which increased their imaginative thinking. (Ambo Saidi 2018) indicated that active reading helps students to enhance scientific communication and discussion. dialogue and cooperation between students with each other and their teacher and building positive attitudes towards scientific reading through their acquisition of the skill of active reading. (Ambo Saidi, 2018, 602)

4-The active reading strategy helped organize the ideas resulting from past experiences in order to think about a problem by analyzing imaginary images and expressing by drawing. (Ambo Saidi 2018) indicated that the active reading strategy SQ3R helps to organize the relationships between things, phenomena and ideas and linking them together in pictures New development and understanding of shapes and their analysis. (Ambo Saidi, 2018, 602)

Conclusions:

In light of the results of the current research, the following can be concluded;

1-Harmony of the active reading strategy with the educational trends that make the learner the focus of the educational process.

2-Teaching by adopting the active reading strategy had a positive impact on the imaginative thinking skills of the second intermediate grade female students.

Recommendations:

In light of the results of the current research, we can recommend the following;

-Encouraging biology teachers to use modern strategies in teaching that enable students to employ their own skills in directing learning and thinking processes, and help them take personal responsibility for learning.

Suggestions;

The effect of the active reading strategy on other variables such as pivotal thinking, critical thinking, creative thinking, and concept acquisition in other branches of science.

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