The Impact of a Proposed Strategy According to Active Learning in Achievement of Mathematics and Visual Intelligence Among Intermediate Students

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Sabah Saeed Hammadi(✉)
General Directorate of Education Baghdad/Karkh First, Baghdad, Iraq
dsabah159@gmail.com

Abstract—Find the impact of a proposed strategy according to active learning in the achievement of mathematics and visual intelligence among first-class intermediate students. To achieve this, the researcher adopted the experimental research method with two groups (experimental and control) with a post test. The research community, which represents the first intermediate class students from the Karkh 1st Education Directorate, was determined. The research sample was intentionally chosen (60) students. The sample was divided into two groups, an experimental group that was studied according to the proposed strategy and a control group that was studied according to the usual method. Parity was made between the two groups in the variables (chronological age, IQ level, previous achievement in mathematics). For the purpose of collecting data for the experiment, the achievement test was built in (20) test items of objective type, and a test of visual intelligence in its final form of (15) items also "objective type". The results indicated that students of the experimental group who studied according to the proposed strategy outperformed the students of the control group who studied according to the usual method.

Keywords—proposed strategy, active learning, visual intelligence, mathematics

1 Introduction

There is no doubt that societies today face many challenges in various fields of life represented in the economic, cultural, and social fields. These challenges cannot be faced without an effective educational system that works to prepare an educated person with qualities and characteristics that qualify him to face those challenges. These characteristics and qualities are not limited to the cognitive aspect only, but it is important that they be associated with the learner's possession of lifelong learning skills in addition to thinking skills and problem-solving skills, this cannot be achieved under a traditional educational system, and traditionally teacher [1]. Certainly, the problem of low levels of achievement among students, especially in mathematics, is one of the great problems facing educators everywhere because of its importance and as an indicator of students' success, but in fact It is difficult for students to understand and comprehend

mathematics without activating their role during the presentation and presentation process. In order to organize new knowledge and concepts and increase their interrelationship with the students' previous experiences, it is necessary to adopt modern teaching methods that fit with the educational situation, in order to avoid a decrease in the level of their academic achievement [2]. Theoretical importance of research, active learning strategies encourage students to practice and think about the things they learn and practice. It can be used to motivate students to engage in critical and creative thinking. It keeps students engaged in expressing their ideas in writing, discovering personal values and attitudes, providing and receiving feedback, reflecting on the learning process. Visual intelligence increases the motivation of students to stand out and excel. It helps increase students' ability to think and reflect. As for the practical aspect of providing a special test of visual intelligence for first-class intermediate students, it can be used in the educational field or by researchers. Directing the attention of mathematics teachers to adopt modern teaching strategies that focus on improving students' understanding and skills, providing and receiving feedback. Draw attention to the importance of students' visual intelligence and its role in increasing the ability to think and reflect. The research is limited to all students of the first intermediate grade in the distinguished schools in the General Directorate of Education, Baghdad, Karkh First. The fifth and sixth semesters of the Mathematics Book 5th Edition for the year 2021 prepared by the Iraqi Ministry of Education. Second semester of 2022.

2 Theoretical background and previous studies

2.1 Active learning

The results of educational studies in recent years have shown that the usual method of teaching, in which the role of the teacher is the basis and the role of the student is limited to listening, does not help in creating a new generation capable of facing challenges. At the center of the educational process, for learning to be active, students must engage in experimental work and think at higher levels such as analysis, synthesis and evaluation, because active learning is in fact a strategy that pushes students to think deeply with rich environment that contributes for building their personality and effectively [3, 4]. Strategy is the art of using the available means to achieve the purposes; being a scientific information system [5, 6]. The proposed strategy is set of sequential steps, which based on displaying pictures, posters, and video clips from real life that contain the required shapes, and students are asked to identify and extract them. Active learning is every educational procedure that the learner takes inside or outside the classroom, more than just sitting still and silent in front of the teacher, which results in a modification in one aspect of his behavior according to the goal and direction of that procedure [7, 8]. Active learning relies in its theoretical basis on cognitive theorists such as Paolo Freire, which his main educational philosophy revolves around the idea that education becomes more effective when it is within the student's own knowledge and vision of the world, so the student's culture and society play an important role in learning [9]. Vygotsky's Proximal Growth Zone Theory argues that students learn best when new information presented to them is beyond their reach. Cognitive learning

theories are concerned with thinking processes during learning and are considered the work of Piaget, whose research focused on the development of logic in children, but his work on the cognitive structure and the effects of the environment on cognitive development put his research within learning theories [10, 11].The constructivist theory has its philosophy on learning, as it views it as an active building of knowledge for a learner who is affected by interactions with the environment and by communicating with others and with his cognitive processes themselves, to varying degrees according to his abilities [12, 13]. Active learning has a set of principles based on which it is related to the learner and the teacher, It encourages interaction between the teacher and the learner inside and outside the classroom so thus helps to build strong relationships between them. It is an effective basis for building good social and human relations due to teamwork. Active learning is based on the student as the focus of the educational process, and therefore he is given information that suits his abilities and capabilities. The teacher has a big role that is broader than giving information, but rather than helping students to achieve educational goals and to be compatible with themselves and with others. Providing support, feedback and reinforcement by the teacher has a great role in the educational process. It is important for teacher to be mastered of active teaching situation. The teacher should pay attention to the individual differences between the students and pay attention to their learning patterns and be well aware of his role as a role model and model for his students [14, 15]. "Active learning" is the best way to get rid of the problem of individual differences between learners in terms of abilities, interests, opinions, beliefs, and learning methods in themselves. It allows a wide scope for the learner to be involved in the learning and teaching process, and this opens the way for deeper learning, and many studies in this context indicate that the learner does not learn only by listening, memorizing and repetition, because this does not go beyond the stage of remembering, while encouraging students to participate in The activities lead them to discuss and ask questions, and thus make them retain information better, and also help them to develop their thinking abilities. The main objective is to stimulate the thinking habits of students so that they think about how to learn and what to learn, while increasing the level of responsibility placed upon them to educate themselves themselves. It pushes students to deep learning, which allows the student to deal with the unlimited amount of knowledge that characterizes this era [16, 17]. As [18] describes the method of deep learning as good learning, because the goal of those with a deep learning style is to study for the sake of study, not for the sake of the exam or avoiding failure, which is an end in itself. Active learning depends on many activities that reduce negative educational activities, such as passive listening...etc. This in itself increases students' motivation towards learning, and the learning process is pleasant and interesting for them, thus avoiding negative manifestations such as boredom and dissatisfaction with school work, etc. This is followed by problems, such as absence and dropping out of school (school dropout). It is also important for the teacher, as he finds work fun, and it is easy for him in the context of active learning to take into account the individual differences among learners. Facilitates immediate and effective feedback. Learners gain new learning styles by observing others as a result of contact and exchange of knowledge. It develops self-learning skills, as the activities that are presented to learners according to the philosophy and procedures of active learning help the continuous desire for knowledge provision that suits the rapid development in the fields of science. It develops

on both sides (the student and the teacher) the desire to think, research and learn until perfection. It increases learners' self-confidence and self-reliance significantly, and that the tasks they accomplish during the learning process by themselves are of higher value than if they were accomplished by other people [19, 20]. It is axioms in the field of education that there is no single method of teaching and learning that enables us to achieve all educational goals, that suits the learners and takes into account the individual differences between them, so the diversity of methods is one of the most important characteristics of active learning, emphasizing the importance of the student's important role in it, achieving independence and integration with others, and the role of the teacher in providing them with appropriate opportunities to acquire new skills and knowledge. In order to apply active learning methods, careful and appropriate preparation must be made to reach the desired goal, and each method must be commensurate with the goal, the situation, the learners... and other data [21]. In general, on the basis of the objectives of active learning and the principles on which it was built, educators have developed many methods in which active learning is applied, depending on several criteria (such as the subject and the study stage, objectives, the ruler ... etc.), accordingly the researcher suggested a strategy based on criteria and principles Active learning consists of the following steps: at this stage, the teacher begins by showing the students a set of pictures that are from the reality of life, but in which there are forms related to their lesson. They are asked to extract these shapes and record them individually on the board. After completing the list, he begins by defining each shape and giving its properties. Explain the topic with examples. After they are finished, they are asked to draw or mention the figure from the reality of your life. The researcher concludes from the foregoing the importance of using modern and diverse strategies, the choice of which depends on the school stage and age and on the nature of the courses so that the teacher can present the material in an interesting way that attracts students to lesson, taking into account the individual differences between students, in addition to making mathematics an interesting lesson outside the boundaries of the class and school.

2.2 Visual intelligence

Intelligences differ in their development among individuals, as they can be developed if they have the motives and find the appropriate encouragement and training. Intelligence has a structure or structure and has a scope that expresses organized activities that take place within the framework of a culture. Any existing domain can be identified by one of the types of intelligences. Emphasizing that capacity has a content of processes that can be inferred by differentiating between the term intelligence and the term pattern by observing the situation in which the individual lives with all its elements [22, 23] .Mathematics is one of the most necessary curricula to include many activities of multiple intelligences in its content in order for the student to deal with them using his abilities and multiple intelligences, to be a producer of scientific knowledge and not a memorizer of it [24, 25]. Accordingly, the role of the teacher has changed from merely giving information and skills to students in a theoretical or practical way, to contributing to the preparation of educational and productive scientific

activities and training and guiding his students to realize and perform them in their educational form when using the activities of multiple intelligences [26, 27]. Visual intelligence at its simplest levels is the ability to recognize and enjoy colors and shapes, create simple images, shapes, and models, and physically manipulate them, in addition to manual assembly of parts. Forming mental images and seeing shapes from different angles. The owner of this intelligence is also characterized by the ability to remember details of images and shapes, draw maps, determine paths, and understand engineering drawings [28–30]. It is the ability to perceive the visual-spatial world internally in an individual's mind - efficiently and in an organized manner, as well as the ability to form spaces, spaces, sensitivity to colors, lines, shapes, space, and relationships between these elements [31]. The researcher defines it procedurally as the ability shown by the first intermediate grade students to respond to the test items measured by their visual intelligence test, which was prepared for the aforementioned purpose and is measured by the degree that the students obtain. Visual intelligence has abilities such as remember through graphics and diagrams. Access to meanings through pictures. Remember the routes well, even if the places are unfamiliar. Distinguishing the four directions in any place, while distinguishing the direction if it is upside down or on the side. Solve puzzles in the form of mazes, shapes, and imagine spinning. The use of shapes and images in reading. High observation of distances, volumes, and areas. Easily read maps and the ability to draw what others are saying. Representation of information geographically in the form of graphics or maps. Understand the relationships between shapes [32, 33]. Its relation to learning and education, [34–36] conveys in his book Frames of Mind that the most important thought processes are through our perception of the world, as sight is the first sensory organ that gives a basis for our cognitive processes and confirms that the visual imagination is a primary source of thought. Also confirmed that the human brain can absorb (36000) images per minute and that 80% of the information that the brain receives comes through sight, and from the installation of this information and operations through the sense of sight, the person obtains knowledge, and studies have proven that each person has a method Different from the other by obtaining visual knowledge [37]. There are a number of requirements for developing visual intelligence in the classroom, including relying on teaching on images, shapes, conceptual and mental charts, and thinking maps. Use colors to identify important points. Giving students enough time to observe and collect information. Encourage students to write notes they see and then discuss what they noticed. Assigning students visual activities [38, 39–41]. Researcher concludes that the development of mental abilities is a basic requirement today and advocated by many global educational systems because of its importance in the personality of the human being who keeps pace with the challenges of the times and which helps to create a generation capable of facing.

2.3 Related work

Some previous studies which are compatible with the nature of the independent and dependent variables to benefit from them.

Table 1. Studies dealing with research variables

No.	Name; Year; Country	Subject	Sample	Curri-Culum Type	Tools	Statistical Means	Results
1	Coy; 2001; USA	Math.	48 students	experimental	achievement test	Arithmetic means; standard deviation	There is a statistically significant difference between the experimental and the control group in the achievement test
2	Mcmahan & Rose; 2004; USA	Mathematics	288 Elementary students	descriptive	visual intelligence test	Means, st. dev., percentage, Pearson's coefficient	There are correlations between the multiple types of intelligence, 3 of which are positive, namely, linguistic, visual, logical. The achievement can be predicted through logical-math. intelligence
3	Rosyana & others; 2018; Indonesia	Math.	142 Stud.	experimental	Math problem solving ability test; Mathematics behavior scale	Means, st. dev., t-test, homogeneity test, SPSS	Improving the ability of experimental students to solve the math. Problem in comparison with the ability of control students, the mathematical behavior of experimental stud. is better than it is for the control
4	Sepriyanti & others; 2018; Indonesia	Mathematics	128 students	experimental	Mathematics problem solving ability test; Math. behavior scale	Means, st. dev., t-test, homogeneity test	The ability of experimental students to solve the problem of math. is better than of the control, the math. behavior of experimental students is better than it is for the control

3 Search procedures

The experimental research method was chosen, including "Experimental Design" of two experimental & control groups with a post-test, which is one of the "Real Designs". The proposed strategy for active learning (independent vari.), achievement plus visual intelligence (dependent variables). The research community consisted of first-class intermediate students in the first Karkh Education Directorate in Baghdad. The researcher chose Al-Mutamayzeen/Al-Khadra High School for Boys intentionally from the First Karkh Education Directorate to apply the experiment because researcher is a teacher in it; and contains four study divisions for the first intermediate class. The experimental group consisted of (30) students, and the control group consisted of (30) students. For the internal integrity of the design, the two research groups were equalized in (age, level of intelligence, previous information in mathematics for 6th class primary). The external integrity of the design through the choice of the professor of the material, as the researcher taught the proposed strategy for the experimental and control groups. The academic content where the two classes were taught and for both groups. The trial period was equal for both groups, which is (19) lessons and within the" second semester" of academic year (2021–2022). Distribution of classes, as the number of lessons scheduled for the first intermediate grade students of mathematics is (4 lessons) per week.

Table 2. Equivalent

Variable	Group	No.	SMA	Standard Deviation	t-test		Statistically Significant
					Calculated	Scheduled	
Chronological age	Exp.	30	161.633	3.371	0.699	2000	not significant
	Control	30	162.066	3.356			
Intelligence	1	30	41.033	5.504	1.234		
	2	30	40.040	5.898			
Previous achievement	1	30	73.566	11.709	0.104		
	2	30	73.333	12.541			

Note: Exp. = 1; Control = 2.

3.1 Achievement in mathematics test

After the educational subject was determined, the special behavioral objectives were formulated and their number was (45) behavioral objectives, according to Bloom's scale for behavioral purposes. A test map was developed to determine the questions for each of Bloom's six levels, based on the judges' opinion, the total number of questions (20) items of the objective type was determined. Test was presented to arbitrators in the field "Methods of Teaching Mathematics" to take their opinions and observations. After taking their opinions, it was ready to be applied to the exploratory sample. To find out the clarity and understanding of the test paragraphs, the clarity of the answer instructions, and to calculate the time taken to answer, the test was applied to a sample of (100) students from Al-Mutamayezen High School/Al-Harithiya. The paragraphs were

clear to the students, the time was calculated, and it became clear that (60) minutes was sufficient to perform the test [40]. Statistical analysis of the paragraphs requires calculating the discrimination coefficient for every paragraphs and its value ranges between (0.30–0.80), these indicators are a good. Difficulty Coefficient for the paragraph and the results ranged between (0.37–0.72) which are acceptable, and it is recommended to keep it .Extracting the psychometric properties of the achievement test starting with honesty, as two types of honesty were extracted, namely apparent honesty. The final exam agreed (80%), thus all test items were considered valid for measuring the students' achievement from the sample. The content validity as a test map was drawn up in which the objectives were explained at their levels with the number of hours needed to study each topic. It was presented to a number of arbitrators and was approved by (80%). Thus, the test is valid in content, in addition to conducting statistical analyzes from the calculation of the coefficients of ease, difficulty and discrimination, as it is one of the indicators. The validity of the content in addition to what was indicated in the test map. Stability The stability was extracted using the Kuder-Richarsdon Equation - 21, and the stability value was (0.80), which is considered an acceptable stability. Thus, the achievement test has acceptable sincerity and stability, its paragraphs acceptable. Thus, the achievement test is ready to be applied in its final form.

Table 3. Specifications for the achievement test

Behavioral Goals			**Remember**	**Comprehension**	**Application**	**Analysis**	**Summation**
			10	**16**	**14**	**5**	**45**
chapter	The number of hours	relative weight	relative weight 22%	relative weight 36%	relative weight 31%	relative weight 11%	100%
fifth	11	38%	2	3	2	1	8
Sixth	18	62%	3	4	4	1	12
sum	29	100%	5	7	6	2	20

3.2 Visual intelligence test

Researcher was briefed about the theoretical research background that was presented in determining the features of the theoretical concept of visual intelligence. Preparing the test items in its initial form in the light of the visual intelligence capabilities mentioned above. The test was built and its paragraphs consisted of (15) items of the objective type in the form of pictures and mathematical drawings that require thinking to complete the figure or choosing numbers to complete the solutions in the picture. In order to complete the initial form of the test, the test instructions were prepared and taken into account to be clear and to indicate results obtained from it, are for scientific research only; not used for other purposes. The sample members were asked not to leave any paragraph unanswered and to write the solution of each paragraph directly below it. The test was presented to the arbitrators, after the paragraphs of the visual intelligence test were identified in its initial form and the instructions for answering them were presented to a group of experts and specialists in education, psychology and

methods of teaching mathematics to express their opinions and observations regarding the validity of these paragraphs. In its initial form, its paragraphs were approved by (80%) or more of the opinions of experts. The exploratory application to know the clarity and understanding of the test paragraphs by the sample of the survey application, the clarity of instructions to answer it and to check the time taken to answer, the test was applied to (100) students at the first intermediate class students and who are not students of the research sample (high school distinguished Al-Harithiya for boys). The time taken to answer was calculated by calculating the weighted mean between the first and last five students who took the test, (45) minutes was sufficient. Statistical analysis; "Difficulty Coefficients" were extracted, it's between (0.27–0.74) and were considered acceptable. As for the discrimination coefficients, the ratios ranged between (0.24–0.69) and considered among the acceptable ratios. Validity Coefficient; Verification of the psychometric properties (of the test). Face Validity; The test paragraphs are appropriate for purpose of which they were developed, thus the test is apparently valid. The Reliability He sought to extract the stability using the Kuder - Richardson Equation 20, stability was (0.79), which is considered an acceptable stability.

4 Results

The following null hypotheses were made:

1. There is no statistically significant difference at the significance level (0.05) between the average scores of first-class intermediate students who studied according to the proposed strategy and the students who studied the same subject by usual way in achievement test.
2. There is no statistically signifycant difference at the significance level (0.05) between the average scores of first-class intermediate students (the experimental group) who studied according to the proposed strategy and the students who studied the same subject in the usual way (the control group) in the visual intelligence test.

4.1 Academic achievement results

Table 4. The achievement test

Groups	No.	Mean	Var.	Std. Div.	t-test		Statistical Significance at the Level (0.05)
					Calculated	Tabular	
Exp.	30	40.366	41.765	6.463	3.545	2000	statistically significant
Con.	30	35.566	66.379	8.147			

From the above table, the (3.545) is higher than the "tabular value", which indicates the existence of a statistically significant difference in the achievement, and therefore the null hypothesis is rejected and the alternative hypothesis is accepted. The researcher believes that the reason may be the adoption of a proposed strategy according to active learning, which helped students to think and reflect.

4.2 Visual intelligence findings

From below, value of t-test is higher than tabular value, which indicates the existence of a statistically significant difference in visual intelligence, and therefore the null hypothesis is rejected and the alternative hypothesis is accepted. The researcher believes that the reason may be the adoption of a proposed strategy based on active learning that encourages students to explore new ideas and concepts through their direct interaction with educational situations.

Table 5. Visual intelligence test

Groups	No.	Arth. Mean	Var.	Sd. Var.	t-test		Statistical Significance
					Cal.	Tab.	
Exp.	30	62.466	51.912	7.205	2.290	2000	statistically significant at the level (0.05)
Control	30	57.172	106.647	10.327			

5 Conclusions

Teaching according to the proposed active learning strategy contributed to improving the achievement of first-class intermediate students. Developing the mental abilities of the learners so that it enabled them to link between what they see and explain it mentally. The use of modern teaching strategies has an impact on improving thinking processes better than the traditional method for first-grade intermediate students. Teachers must use new strategies that encourage students learning, thinking, in addition active learning strategies. Holding training courses for teachers on active learning strategies.

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7 Author

Sabah Saeed Hammadi, He is presently Ass. Prof. Dr.; Teacher at Mutamayzi Al-Khadra High School/Karkh First Education, Baghdad province, Baghdad, Iraq. He is interested in methods of teaching mathematics. He is the author of a book called Ordinary Differential Equations. The number of articles in national databases – 6. E-mail: dsabah159@gmail.com

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