The Impact of a Scenario-Based Learning Model in Mathematics Achievement and Mental Motivation for High School Students

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Areej Khuder Hassan[1], Sabah Saeed Hammadi[2], Ban Hassan Majeed[1](✉)
[1]College of Education for Pure Science, Ibn Al-Haitham, University of Baghdad, Baghdad, Iraq
[2]General Directorate of Education Baghdad Governorate, Karkh First, Baghdad, Iraq
ban.h.m@ihcoedu.uobaghdad.edu.iq

Abstract—The aim of the research is to identify the effect of a scenario-based learning in the mathematics achievement and the mental motivation for fifth – scientific grade students in high school. To achieve it, the researchers adopted the experimental research method with two groups (experimental and control) with a post-test. The research community was identified, which represents the fifth scientific grade students from the first Karkh Education Directorate. The sample (60) students were chosen intentionally, and was divided into two groups: an experimental group that studied according to the scenario-based learning model; and a control group studied according to the usual method. For the purpose of collecting data for the experiment, the achievement test was built, in its final form, consisting of (10) test items of the type of essay, and the mental motivation scale, in its final form, consisting of (60) items. Appropriate statistical analyzes were conducted, and the psychometric properties of the test and scale were confirmed. The results indicated that the students of the experimental group who studied according to the scenario-based learning model outperformed the students of the control group who studied according to the traditional method.

Keywords—scenario – based learning (SBL), model, mental, motivation, achievement, mathematics, students, high school

1 Introduction

Achievement is one of the important concepts that educational institutions seek to raise as the final outcome of the education process and the basic element through which the student is judged to rise to a new stage [1, 2]. Despite the emergence of many modern teaching methods and strategies, we still suffer from low achievement among students with low motivation in the education process, unwillingness to learn, and their constant sense of a barrier and difference between what they learn in the classroom and their daily in their real life [3]. Therefore, there was a strong need for new models that work on learning through the daily reality of students. Recently, many educational trends and theories have emerged that keep pace with the nature of the times and the life we live in, which aim to provide learners with knowledge, skills

and positive tendencies towards what they learn, including the learning model based on scenario. So, the problem can be summarized as: What's the effect of the (SBL) model in the achievement of mathematics and mental motivation for students at fifth scientific grade?

2 The general framework

The importance of this research can be demonstrated theoretically as it considers the scenario-based learning model to be one of the modern models in education. This model improves the performance of learners. Develop students' skills. It is an effective introduction that provides a framework for active learning. Social learning that enhances relationships between students in a real environment. It is an important tool for linking the theoretical and practical side. Studies have shown an understanding of students' motivation for achievement, success. The mental motivation increases the learners' desire to use their thinking and creative abilities. Mental motivation makes learning more enjoyable because it meets their desires; therefore, the focus is on the students themselves, their knowledge, skills, and attitudes, and not on the academic content. As for the applied side, it is important to know whether there is an effect of learning model based on scenario on the mental motivation and scientific achievement of high school students; also providing a measure of mental motivation may be used in the instructional field. In addition; attracting attention of mathematics' teachers adopting the newest models in educating, which focus on the realistic side in providing students with knowledge and skills, and emphasize linking the theoretical and practical side together. Plus supplying a plan on how to use the learning model based on scenario in teaching. The research is determined by students of the fifth scientific grade/ General Directorate of First Karkh Education/Baghdad Governorate. Chapter Four (circular functions) of the content of the mathematics textbook for 5th grade students, 1st edition, for the year 2021, which was authored by a committee in the Ministry of Education. 1st semester/academic year (2022–2023).

3 Literature review

3.1 Scenario-based learning model

The learning model based on scenario is defined as a dynamic, non-linear approach to the events of the learning process through original activities in realistic communities in which the learner participates. The originality comes through making scenario contexts as realistic as possible [4]. So, it's procedurally definition is a systematic entrance to the events of the learning process by employing the content of fifth grade science mathematics in life situations from the reality of students in the form of stories [5]. It is one of the modern approaches for teaching, and it is based on situational learning theory, as the theory focuses on the importance of learning occurring in the context of real-life scenarios, because this improves and proves meaningful learning for students [6, 7]. It is also based on the theory of situational knowledge, which means that knowledge must be gained in its context, in which students participate with each other in training on scenarios reproduced from the real world [8–11].

It is also based on a number of assumptions, namely, realistic learning is the best type of learning. Learning should be a fun process. Making mistakes is part of the learning process. Learning happens when you can get students into real life situations in which they perform certain tasks and get feedback to correct their mistakes [12–14].

It is characterized by providing immediate feedback that helps learners to improve and enhance their performance, and aims to provide students with the skills that they are expected to encounter in their future profession, because it gives them the opportunity to participate in the collaborative solution to the problems raised in a safe and stable environment [15–18]. In addition, it is used in multiple ways and is given a set of teaching methods and methods such as (learning based on problem – educational games – simulation – learning based on case study – learning based on project). The trend for this type of learning has recently appeared in learning environments because it provides them with immediate internal and external feedback [19–21]. Preparing a scenario is not a simple task. The scenario must be as realistic as possible, and it must include the roles that students will play, the tools used, and the actual activity they will participate in [22, 23]. Scenario based learning can be used in online learning, such as simulations and adaptive media. So, if it is carefully designed, it achieves several educational gains [24–26].

Designing SBL. Educators agreed that good educational design requires sufficient knowledge and familiarity with the nature of cognitive processes, because the chance of success in providing effective educational design will be very small in the absence of understanding the nature of the mechanisms of the learning process and problem-solving [27–30]. The design of scenario-based education (SBE) begins with the planning stage, then the implementation, followed by the review, then the modification, and then the evaluation [31]. The following Figure 1 shows the phases for designing.

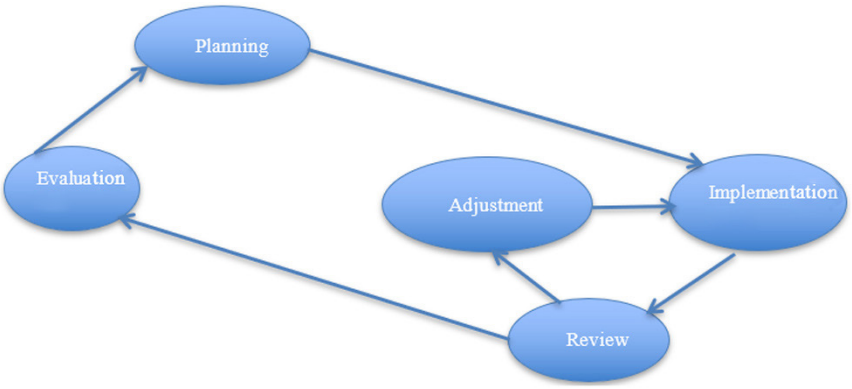

Fig. 1. Steps of designing SBL

Learning based on scenario should be used in subjects that require problem-solving, decision-making, and troubleshooting, i.e. non-routine subjects that require higher levels of thinking [32, 33]. It is suitable for age groups that have knowledge experience in the topics that the scenario will address, because integrating inexperienced learners into the scenario-based learning environment may cause them a mental burden [34, 35]. Where the activities included in the scenario depend on achieving

individual and collective practice by students of the skills included in the content of the scenario, and this practice would enable students from the theoretical and practical side of the specific content, and it should be concerned with achieving the fun of learning at the same time and for students to integrate into the scenario to achieve the required [36]. The researchers believe that the learning model based on scenario-is an educational model similar to the educational design, which helps learners to link the theoretical side with the applied side, which results in students acquiring knowledge and skills in an atmosphere of fun that leads to the development of their emotional side. Despite the difference in many aspects between the learning model based on scenario and traditional education, however, can be combined to achieve diverse and differentiated goals [37].

Types of "SBL".

1. Scenario based on project: It is a learning based on the implementation of a group of projects assigned to students within the lesson, and it links methodological education and field education. This type focuses on presenting a final product, and the focus is on applying and absorbing the knowledge gained previously [38, 39].
2. Scenario based on the case: In this type, multiple cases related to the topic of the lesson are presented and trained by the learners. This type is based on presenting a variety of cases within a scenario, and students work in small groups according to the scenario to solve the problem presented in it [40].
3. Learning based on context: In this type of learning, knowledge is provided to learners from the reality of their lives, and the real experiences they go through [41].
4. Scenario based on problem: In this type, students are directed to acquire the necessary knowledge to solve the problem, and the new acquired knowledge may be more important than the problem itself. This learning takes place through a set of detailed special procedures that the teacher follows in teaching students and training them on scientific thinking skills in addition to the logical, by mentioning an unfamiliar issue or situation in which it challenges their previous knowledge, and requires reflection, thinking and research to reach the appropriate solution, under the supervision of the teacher and at the time of the lesson [42].

There is a set of criteria that must be met before adopting the 4th type of scenario, which is proposing real and realistic problems from the real life of learners that stimulate their motivation to learn. Choose topics that can be formulated as a problem and have a solution. Avoid problems affecting students' personal lives. Availability of capabilities required to solve the problem. Students' learning can be organized in groups sometimes to develop a spirit of cooperation and exchange of knowledge. Building a safe learning environment for discussions in which students feel comfortable.

The researchers relied on scenario based on the problem in this research, as it is suitable for the age of the sample and their knowledge storage.

3.2 Achievement

Achievement is proving the ability to accomplish what has been acquired of knowledge and educational experience that has been set for [43, 44].

3.3 Mental motivation

Mental motivation is one of the modern and ancient concepts at the same time. It is ancient, as it was dealt with as a dispositional aspect of thinking. Its historical roots go back to Greek philosophy, specifically to Socrates, who emphasized the importance of the innate aspects of man. As a modern concept through what the brain research results have sorted, and its processes and attention to thinking patterns, and this is what was revealed using modern technology from resonance imaging devices and radiological scanning of the brain. It is one of the important variables through which educational goals can be achieved in the cognitive field through the acquisition of information and knowledge, in the emotional field through the formation of attitudes and values, and in the motor aspect through the formation of skills that are subject to training and practice factors [45, 46]. Motivation plays an important and continuous role in most aspects of learning and human growth, such as knowledge, language, perception, and learning. Often appears clear from the beginning of an individual's life [47], because cognitive mental activity is affected by the individual's motives, because these motives affect the processes of emotional control of motor and cognitive activities, and the emotionality that emanates from the individual, so it can be said that the activities of the individual are governed by his motives [48]. Stated that the American Council for Learning had set instructions in 1996 in which it stressed the need to take care of students' self-motivation to direct and adapt to learning technology [49], and [50] believes that most adult learning depends on internal motivation factors and emphasized that Internal motives are stronger and more stable than private factors [51]. The issue of motivation does not only mean that different people have different motives to perform the same thing, but the same person may have different motives for the same behavior during different periods [52].

Classification of motives. Psychologists put several classifications of motives according to the method of studying them, and the most famous of these classifications are physical primary motives such as hunger, thirst, and sex, and psychological secondary such as the desire for appreciation, curiosity, and social status [53]. Emotional motives, which produce the behavior that the individual performs consciously and realize, and the individual feels them, such as choosing the type of education and profession. Subconscious motives, which produce the behavior that the individual performs without his will and without a logical explanation [54]. Biological motives, which are innate and agreed upon by members of the same gender, and are found in all people, regardless of their different environments, such as maternal motives and acquired social motives, which are based on innate foundations, but are affected by environmental factors and socialization and acquired through learning, including the cognitive motive [55]. The researchers believe that motivation is internal and external motivational factors that push individuals to achieve what they aspire to, so it is important to focus on them in education and direct them in the right way to encourage students to achieve self-realization and ambition and satisfy their scientific, psychological desires and motives.

Dimensions of Mental Motivation. Mental motivation has four dimensions, which are approved within the California scale, namely:

1. Mental focus: It is the individual's tendency to persevere and focus in the work he performs, to be regular, and his desire to accomplish tasks in the specified time, and he enjoys determination [56].
2. Orientation towards learning: It is the ability of the individual to generate motivation to increase his knowledge base, as he values learning for the sake of learning as a means to control the educational tasks that he faces in educational situations [57].
3. Creative problem solving: It is the individual's tendency to approach problem solving with creative and original ideas and solutions, and the desire to engage in challenging activities such as riddles, riddles, and strategic games [58].
4. Cognitive integration: It is the ability of individuals to use thinking skills in an (objective) manner, and their tendency to search for truth and open-mindedness, as well as their mental curiosity towards the topics they are exposed to. They distinguish alternative visions, and appreciate personal value and the pursuit of activities of a challenging nature [59].They are the same dimensions that were adopted to build a scale for individualizing the sample

4 Methodology

Researchers adopted the experimental research style, including the experimental design of two experimental plus control groups with a post-test, which is one of the real designs, as the model represents learning based on scenario (independent variable); mental motivation with achievement (dependent variables) [60].

The research community consisted of all the fifth scientific grade students/general directorate of education/Karkh 1st. As for sample, the researchers intentionally chose the green preparatory school for boys to conduct the experiment because it contains four academic divisions for the fifth scientific grade. Randomly class (C) was chosen to be the experimental group which formed from (30) students; and division (B) to be the other group which is also (30). Both internal, external safety of the design has been calculated, as shown in Table 1.

Table 1. Internal safety

Variable	Group	No.	SMA	Std. Dev.	t-Test		Significance Level (0.05)
					Cal.	Tab.	
Age	Exp.	30	161.633	3.371	0.699	2.000	Not significant
	Con.	30	162.066	3.356			
Intelligence	Exp.	30	41.033	5.504	1.234	2.000	Not significant
	Con.	30	40.040	5.891			
Previous Achievement	Exp.	30	73.566	11.709	0.104	2.000	Not significant
	Con.	30	73.333	12.541			

4.1 The tools

The educational content was determined, specific behavioral objectives were formulated were (42) according to Bloom's taxonomy. A specification table was done to specify the questions for each of the six Bloom levels, and based on the opinions of arbitrators, the total number of questions was determined (10) of the essay type; Table 2 shows the details.

Table 2. Test map (specification table)

Behavioral Goals			**Remember**	**Understanding**	**Application**	**Analysis**	**Sum**
			8	**12**	**17**	**5**	**42**
Content			19%	29%	40%	12%	100%
Chapter Four	No. of lessons	relative weight	2	3	4	1	10
Sum	21	100%	2	3	4	1	10

Statistical analysis of the items of the achievement test was carried out to obtain statistical indicators, and all of them were acceptable and it is recommended to keep them.

4.2 Mental motivation scale

Given that the researchers were not able to obtain a special tool to measure the mental motivation of the fifth scientific grade students. They built a tool for purpose of achieving one of the objectives of this research. So the requirements for building scale necessitated following a number of procedures that were necessary in order for it to be reliable as a research tool to measure of mental motivation among fifth-grade scientific students. They were sequenced as examining of the educational goals (as one of the researchers obtained the goals from the Ministry of Education/curricula and books/mathematics curricula for the preparatory stage) for teaching the mathematics book for the fifth scientific grade and for the preparatory stage. Peruse the literature (books and articles) written on mental motivation. View some Arabic and Foreign scales to measure mental motivation. Then it was verified:

A. Virtual honesty: The items of the mental motivation scale were displayed to experts in education, psychology, measurement, evaluation, and methods of teaching mathematics. By using Cooper's equation, the agreement reached (94%).

B. Reliability: Scale was applied to a random sample other than the research sample, consisting of (100) students from the fifth scientific grade, and the reliability coefficient was (0.85), and it is considered a good reliability coefficient that can be trusted.

C. Description of the Mental Motivation Scale: It consists of (60) paragraphs, and a paper was attached to it for the purpose of answering the scale, in which alternatives were placed as follows: (always agree, agree, disagree, always disagree).

5 Results and discussion

5.1 Achievement

The validity of the first hypothesis was tested: "There is no statistically significant difference at the level of significance (0.05) between the mean scores of students of experimental group who studied the subject of math. assigned to them according to the scenario-based learning model, and students of the control group who studied the same subject in the usual method in achievement test". As in Table 3.

Table 3. Achieve test

	DF	Var.	Standard Deviation	SMA	DF	t Value		Indi.
						Calculated	Tabular	
Experimental	30	84.07	14.00	196.00	58	2.391	2.000	signifier
Control	30	56.57	11.72	137.36				

Note: Indication level = 0.05.

It is noted from the above table that the calculated value of the t-test is higher than the tabular value at the signifycance level, which indicates a statistically significant difference in achievement. Therefore, the null hypoth. is rejected and the alternative is accepted. Researchers believe that scenario-based learning is more effectiveness than the traditional one is through achieving the scientific and educational goals in teaching mathematics. Relying on vocabulary prescribed curriculum on the one hand, and taking into account the characteristics of students' mental development on the other hand. Achieving a balance between them helps the success of the educational process, and this was done by presenting the material and presenting mathematical concepts in a manner commensurate with the students' level of knowledge and the stage of intellectual and psychological maturity. Thus, topics were presented in general and mathematical facts, concepts and generalizations in particular.

5.2 Mental motivation

The second null hypotheses: "There is no statistically significant difference at the significance level (0.05) between the mean scores of the students of the experimental group who studied the subject of mathematics assigned to them according to the scenario-based learning model, and the students of the control group who studied the same subject in the usual way in the mental motivation scale" was tested, as shown in Table 4.

Table 4. MMS

Group	Sample	Mean	Variation of Variances	Degree Freedom	t-Value		Statistical Significance at Level (0.05)
					Cal.	Tab.	
Exp.	30	1.507	0.867	58	5.531	2.000	Sig.
Con.	30	1.330	0.052				

Obviously, that calculated value of the t-test is bigger than the tabular value which indicates a statistically signi. difference in mental motivation. So, the null one is rejected and the alternative is accepted. From foregoing, it appears the experimental group is superior to the control group in mental motivation, depending on the T-value calculated for the experimental group, which is greater than the T-value calculated for the control group. This confirms the impact of the scenario-based learning model on the mental motivation of the fifth scientific grade students.

6 Conclusion

The experimental group' students outperformed on students of the other group in achievement plus mental motivation. Using of activities included in the scenario had an impact on the students in terms of retaining information. Throughout the experiment, students enjoyed learning based on scenario because they felt able to deal with their daily problems. Recommending preparation, training departments in the general directorates of education to hold courses for teachers to train on learning model based on scenario. Also; for the general directorate of curricula to include this form in the teachers' guide. Emphasis on teachers of the need to link education within schools with the real life of students to strengthen their sense of the importance of what they learn. As a complement to the current research, the researchers suggest conducting a similar study on female students and comparing the results. Also, a study of the impact of learning model based on scenario on multiple intelligences; and a study of the same impact on creative problem solving .

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8 Authors

Areej Khuder Hassan; She is presently Asst. Prof. Dr. in Methods of Teaching Mathematics and one of the faculty members in the College of Education for Pure Science/Ibn Al-Haitham, Computer Department, University of Baghdad, Iraq. E-mail: areej.k.h@ihcoedu.uobaghdad.edu.iq

Sabah Saeed Hammad; He is presently Asst. 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. E-mail: dsabah159@gmail.com

Ban Hassan Majeed; She is presently Asst. Prof. in Mathematics Education and one of the faculty members in the College of Education for Pure Science/Ibn Al-Haitham, Computer Department, University of Baghdad, Iraq. E-mail: ban.h.m@ihcoedu.uobaghdad.edu.iq

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