

# Educational Learning Design Based on the Stem Approach Entrance and Its Impact on the Scientific Development of the First Grade Mediterranean Students

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The aim of the urging is to build a proposed educational design based on the STEM Approach on the scientific enlightenment of middle first grade students, and it included all students in the Great Prophet's Medium for Boys, numbering (70) students divided into two divisions, one is experimental and the other is controlling. The researcher built the proposed design with the STEM Approach entrance, and the researcher built a 40-paragraph scientific literacy scale that has been conducted with the specifications of honesty and reliability. The results showed the effectiveness of the proposed design in the scientific literacy. The study made a number of recommendations and proposals.

**Key words:** *Instructional Design; STEM Approach; Scientific Literacy.*

## Introduction

### *Research Problem*

The world is witnessing a tremendous expansion in the field of knowledge, and the generation of ideas to face the situations of life in the present and the future, and in all areas of life, including education, which is the basis for them. Therefore, most of the developed world countries pay great attention to preparing the human being in a proper number in harmony with this development. Accelerated, and this is through choosing the appropriate content and methods of teaching it to ensure the learner interacts with him and learn and then apply it, but our traditional schools (in Iraq) were and still rely on the scientific material and

focus heavily on the learners' indoctrination of information, i.e. preservation and retrieval at the time of the exam, and from The researcher's experience in teaching and his constant contact with physics teachers directly; he touched that the majority of teachers do not take charge of designing the education process in a systematic way, but that the process is almost randomly irregular, which prompted the researcher to build an educational design based on the entrance STEM approach by adopting some active teaching strategies. Therefore, the research problem is determined by asking the following question:

What is the effect of an educational design with a model based on the STEM Approach by adopting some active learning strategies in scientific literacy among middle school students in physics?

### ***Introduction***

Science of Instruction Design is one of the sciences that is concerned with describing the procedures for selecting an educational subject including (hardware, tools, materials, programs, as well as curricula) to be designed, and then analyzed, organized, developed and evaluated. In order to arrive at a curriculum design that helps learners better and faster, and helps the teacher follow the best teaching methods with the least time and effort possible (Wiley, 2000). The educational designer is a teacher who approaches educational planning with the goal, and he possesses specialized knowledge in the field of teaching and is able to benefit from systemic processes in identifying educational challenges, so the educational designer here deals with these challenges through the skillful application of extensive experience with tools, so the educational designer knows They know how their students learn, and they have a deep understanding of the content (Seels & Richey, 2012).

### ***The Importance of Educational Design***

Educational design has several practical benefits, which educators are almost unanimous in, which can be summarized as follows:

- 1- Improving educational practices by using educational theories during carrying out the educational process at work.
- 2- Saving effort and time.
- 3- Using the educational aids, devices and tools in a good way.
- 4- The learner depends on his self-effort during the learning process.
- 5- The learner interacts with the subject.
- 6- Finding the relationship between applied theoretical principles in educational situations.
- 7- Explaining the role of science in facilitating the learning process.

8- Proper evaluation of student learning and the work of the learner.(Gagne, Wager, Golas, Keller, & Russell, 2005)

Through the researcher's briefing on the literature that dealt with local and international educational designs, there were educational designs based on different strategies, but building an educational design with the STEM Approach is the first study of its kind - according to the researcher's knowledge - in the field of science teaching methods As for scientific enlightenment, it was covered by the study of Al-Rikabi 2011.

### ***My Research Goals***

The research aims to:

- 1 - Building an educational design with a STEM Approach entry in physics for middle school students.
- 2- Knowing the effect of the proposed educational design by STEM Approach in physics on the scientific enlightenment of the first intermediate class students.

### ***Research Hypothesis***

- There is no statistically significant difference at the level of significance (0.05) between the average scores of students of the experimental group who will be taught according to the proposed educational design and the average scores of students of the control group who will study in the usual way on the scientific enlightenment of middle class students' .

### ***Search Limits***

The research was limited to:

- Intermediate first-grade students in the day schools of the General Directorate of Education for the Second Karkh Education.
- The Book of Science, Part 1, on Physics, for the first intermediate grade, the second edition, in its three units, which is the first unit (Mohammadmad; et al., 2017).
- The first semester of the year 2017-2018.

### **Definition of Terms**

#### ***Instructional Design***

defined it: 'It is a systemic approach through planning and producing effective educational materials, meaning the planning, development, evaluation and management of the whole educational process effectively with full effectiveness. It is a set of sequential steps and organized systematic procedures through which the material is implemented. Science in any

field of human learning, including the sources of learning, attitudes, programs, lessons, and planned content ”.

### ***Entrance to STEM Approach***

It is an educational approach to teaching science that seeks to remove the boundaries between the main branches of science: science, technology, engineering, and mathematics, which is named from the first letters of the terms (S) Scenes, (T) Technology, E Engineering, (M) Mathematics (Capraro, Capraro, & Morgan, 2013).

### **Scientific Literacy**

An individual's possession of information, concepts, and basic information related to scientific controversial issues and the mechanisms for obtaining that information, which creates a positive trend towards science (Roberts, 2013).

### **Literature Review**

#### ***Educational design***

Instructional design is the practice of creating an educational experience that makes the process of acquiring knowledge an effective and attractive process. In general, the design mechanism consists in determining the current situation of the student and his needs, then defining the goals intended to reach them from the educational process, then planning and designing the steps that They must be followed to reach the desired goals (Merrill & Twitchell, 1994). The course of design steps is governed by concepts derived from (pedagogical sciences) that have proven effective. They can be applied in cases of student studies only, or study by a teacher, or in cases of community education and the design results can be known and measurable, as It may not be apparent or assumed (Gagne et al., 2005).

There are many educational design models, but most of them depend on the five-stage ADDAI Model (analyze, design, develop, implement, value). Among these designs is the ASSURE Model (Al-Khattat, Habeeb, & Mohammed, 2019; Kruse, 2002; Molenda, 2003).

The ASSURE model is an Instructional Systems Design that is used in the classroom by teachers and trainers to design and develop the learning environment to make it more effective. The teacher can also use this model to write lesson plans and to improve the teaching and learning process (Andrews & Goodson, 1980).

The world is currently witnessing a great development in the field of knowledge, including the fields of education in general, and the science of teaching methods in particular, which calls for the promotion of new types of learning among students that work to make them integrated, active, and interactive in the classroom, and participants to make experimental

programs or a solution A scientific problem, leaving the traditional method that works on not being able to stimulate self-motivation and the possibility of developing intellectual curiosity for each of them (Bonwell & Eison, 1991). This has led to the emergence of several opinions in this field that criticize traditional methods and methods and search On new teaching methods and methods , Especially those that provide an opportunity for learners to play an effective and positive role commensurate with their level of education (McCarthy & Anderson, 2000).

Active Learning is a learning style based on a set of different activities that the teacher performs and results in a number of behaviors that depend on positive and active student participation during the educational and learning situation, and its components include student participation in choosing the rules that On the basis of which learning is done, as well as the educational systems and the diversity of its sources, and in setting goals, the evaluation process may depend on students for themselves and their colleagues, and communication between the teacher and students is permitted, and a set of teaching strategies are used that focus mainly on the learner in a consistent manner. Come up with Meh abilities and the degree of intelligence '(Ueckert & Gess-Newsome, 2008).

Accordingly, educators have 'directed their attention towards developing teaching methods and methods that work to obtain the learner's interaction with his peers in the educational situation, as active learning pays great attention to the learner by making it the focus of the educational process (Prince, 2004) In it, many teaching methods and strategies are used that are appropriate to the content and educational situation and take into account the different age stages, in addition to that it works to develop thinking among learners by raising questions about the natural world in which he lives and his relationship with him and others around him (Hohmann). , Weikart, & Epstein, 19 Accordingly, active learning is a method of learning and teaching at the same time in which students participate in various activities that allow them to listen positively, conscious thinking and sound analysis of the subject matter, ' Where learners share opinions about the presence of the facilitator of the learning process, which leads them towards achieving the learning goals (Johnson, Johnson, & Smith, 1998).

## **Measures**

### ***Search community***

The research community means all individuals who share the same characteristics and whose results will be circulated to the researcher (Nikiforakis & Normann, 2008). The research community was represented by all middle middle class students in the General Directorate of Education of the Second Karkh.

### ***Research Sample***

The research sample is part of a community that has all of its characteristics on which the experiment is carried out so that the results are generalized to the community (Campbell & Stanley, 2015).

### ***Experimental Design***

When the teacher is in the classroom, the lesson is executed, as it is the reality in which he implements what he has planned. Therefore, he must be prepared to carry out the lesson, taking into consideration each previous step. This will guarantee the success of the teacher (Roblyer & Doering, 2006). ). The researcher has used Experimental Design (Federer, 1955). Experimental research in educational and psychological sciences requires an experimental design to obtain reliable results. It is no secret that the experimental design is a work plan that enables the researcher to perform His required work perfectly (Christensen, Johnson, Turner, & Christensen, 2011). The experimental design with partial adjustment of the two experimental and controlling equivalents with the post test will be adopted, as the educational design represents the STEM Approach entry (independent variable) and scientific enlightenment (dependent variable), as shown in Table (1).

**Table 1:** Demonstrates the experimental design of the search

<b>Post test</b>	<b>Dependent variable</b>	<b>Independent variable</b>	<b>Equal groups</b>	<b>Groups</b>	<b>T</b>
Scientific Enlightenment	Scientific Enlightenment	Instructional design at STEM Approach entrance	Life time Previous achievement Previous information	Experimental	<b>1</b>
		The usually way		The officer	<b>2</b>

### **Design Stages**

The researcher adopted the ASSURE Model (Al-Khattat et al., 2019) in planning and implementation to build his educational design.

### ***Building the Scientific Enlightenment Tool***

The research aims to discover scientific enlightenment among middle school students, so it was necessary to have a tool to measure it. And because there was no scale for this purpose, the researcher built a tool to measure it according to the following procedures:

- See the literature and studies that touched on the topic of scientific enlightenment.
- Asking an open question to a sample of experts and specialists in the fields of physics, methods of teaching science, and medical school professors, about information that represents a scientific enlightenment that students need to enjoy (Walker, Tan, & Glicksman, 2011).
- In light of the foregoing, the researcher has classified and unified the responses of experts on the survey question within five areas: (radiation pollution, air pollution, biosphere, chemical pollution, physical pollution).
- The researcher has formulated paragraphs for each of these fields, ranging from 20-25 paragraphs for each field. As the total paragraphs of the scale reached its initial form of 80 items.

### ***Face Validity***

It means that a tool that was developed actually measures the phenomenon to be measured (Broder, McGrath, & Cisneros, 2007). The apparent validity of the tool prepared by the researcher has been extracted by presenting it to a group of experts in the field of physics and science teaching methods And educational psychology from the University of Baghdad to extract the sincerity of the arbitrators, and researchers have developed 80% or more of the agreement between experts to keep or delete and amend paragraphs (Mohammed, Al-Khattat, & Al-Muhja, 2019). His paragraphs became (40) paragraphs distributed over the five areas above, where (9) paragraphs were raised and the test paragraphs consisted of an introduction followed by four alternatives A Alone is true and the remaining three are wrong.

### ***Exploratory Application***

Discriminative ability: In order for the scale to be good, it must have the ability to distinguish the groups of individuals tested so that some get high scores and others have lower scores, meaning that the scale has the ability to show differentiated and different groups according to their answers (Reynolds). , Livingston, Willson, & Willson, 2010) Hence the researcher arranged the responses of the respondents in a descending order and then sorted them into two ratios, so that each ratio (27%), and thus the independent T-test was performed. Sample t- test for independent samples and showed no significant differences for some paragraphs of the scale, which indicates lack of c D have a discriminatory ability, prompting to raise the

researcher paragraphs unmarked and the (2) paragraphs, bringing the number of paragraphs (40) paragraph.

### **Reliability**

The scale must be characterized by a degree of stability and stability that makes the results obtained from it reliable (Vallee, Lobry, & Deblecker, 2008). Therefore, the Cronbach's Alpha formula was applied to find the internal consistency of the paragraphs, as it appeared that their value was low as it reached (0.58) By using the scale if item deleted feature, (2) paragraphs were raised to raise the value of the internal consistency to (0.82), as it is considered sufficient to show the internal homogeneity of the paragraphs of scale (Mohammed, 2017) .

Thus, the scale became ready for application in its final form, consisting of (40) paragraphs. As paragraphs (1-8) refer to the first field (radioactive contamination), while paragraphs (9 \_16) refer to the second field (air pollution), while paragraphs (17-24) refer to the third field The field (biosphere) and paragraphs (25-32) refer to the fourth field (chemical pollution), while the paragraphs (33-40) refer to the fifth field, which is the field (physical pollution).

### ***Tool Application***

The researcher applied the research tool to one of the applied-training students-Al-Qadisiyah University during the days (24-28 / 2/2018), using a number of teaching colleagues in the schools concerned with the application to distribute the questionnaire papers.

### **Statistical Means**

The researchers used the SPSS version 24 statistical bag

### ***Show Results***

The research aims to:

1- Building an educational design with STEM Approach entrance for middle school students in physics.

The design and construction process has been done according to the steps of the model.

2 - Knowing the effect of the proposed educational design at STEM Approach entrance for middle school students in physics.

To verify this, the null hypothesis Null Hypothesis ('No, no difference, statistically significant at level of significance (0.05)') was tested between the mean scores of the experimental group students who studied using the educational design at the STEM Approach and the average

score of the students The control group who studied using the traditional method), and after calculating the arithmetic mean and the standard deviation of the two groups, were compared using the T-test for two independent samples, and it was found that the calculated T value had reached (3.154) which is greater than the tabular value Adult (2.00) and this indicates c D difference between the two groups purely for the benefit of the group and the trial is reject the null hypothesis and accept the alternative hypothesis, which is attributed to the model of the proposed teaching ', and Table 2 illustrates this.

**Table 2:** The Results of the Test for Two Independent Samples to Indicate the Differences in the scientific enlightenment between the experimental and control groups.

Significance is 0.05	The value of the tabular t	Computed t value	Standard deviation	average	number	Group
function	1.98	3.15	1.5	30.05	35	Experimental
			2.2	28.63	35	The officer

Effect Size: It is the ratio of variation in the dependent factor due to the manipulation of the independent factor, as it indicates the major role that the conditions of the independent worker play in determining the signs on the dependent factor (Nakagawa & Cuthill, (2007) expresses the effect scale with the 'practical significance', in order to calculate the practical significance, and that the effect of the independent factor (the educational design proposed by the STEM Approach) in the dependent factor (scientific enlightenment) has been completed. Calculating the impact scale by applying the ETA square law Z T value is calculated and then calculate the value of (d) and compared to the value of a measure impact index Cohen, 1988)) (Preacher & Kelley, 2011; Rice & Harris, 2005), table (3)

**Table 3:** Results of the effect size for the dependent variable in the function

The amount of impact	( d )	Eta value	Degree of freedom	Calculated T-Class	Affiliate worker	Freelance worker
Large	1.36	0.469	68	3.154	Scientific Enlightenment	Suggested teaching design

It is clear from the above table that the value of the impact measure (d) for the proposed educational design in STEAM Approach has reached (1.88), which is a high indicator according to the criteria proposed by (Cohen, 1988) because it is greater than ( 0.8), which indicates that the independent variable has a major effect on the dependent variable.

This result can be explained by the proposed education design having had an impact on scientific literacy, to include strategies for active learning, as well as the inclusion of blended education and learning technology that linked science, technology and engineering topics with mathematics.

### **Conclusions**

Through the results of the research, the following conclusions were reached:

- 1- The effectiveness of the teaching according to the proposed educational design at the STEM Approach entrance, as it contributed to raising the level of scientific enlightenment.
- 2- The possibility of using the proposed educational design in the STEM Approach approach in teaching the physics course for the intermediate stage to the available capabilities in schools.

### **Recommendations**

In light of the results of the current research, the researcher recommends the following:

- 1- The use of the suggested instructional design in STEM Approach by teachers.
- 2- The necessity of developing scientific enlightenment for students in physics and for different classes.
- 3- Conducting in-service training courses for physics teachers on using the proposed educational design at the STEM Approach portal.

### **The proposals**

- 1- Conducting studies that investigate the effect of educational designs on other models in other variables.
- 2- Conducting studies investigating the effect of educational design in the STEM Approach entrance in different educational stages.
- 3- Conducting studies that investigate the effect of teaching STEM Approach in other subjects such as biology and chemistry.
- 4- Building a proposed program for training physics teachers in the use of educational design in the STEM Approach approach in teaching the different phases.

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