

**How to Cite:**

Hashem, S. H., & Muslim, M. T. (2022). Building an educational design based on interactive electronic activities and measuring its impact on the reflective thinking of fourth-grade students in physics. *International Journal of Health Sciences*, 6(S5), 9878–9895.  
<https://doi.org/10.53730/ijhs.v6nS5.12097>

# **Building an educational design based on interactive electronic activities and measuring its impact on the reflective thinking of fourth-grade students in physics**

**Sarah Hussein Hashem**

Al-Qadisiyah University - College of Education

**Prof. Dr. Mohsen Taher Muslim**

Al-Qadisiyah University - College of Education

Email: [edu.it.mas.20.15@qu.edu.iq](mailto:edu.it.mas.20.15@qu.edu.iq)

**Abstract**--The aim of this research is to identify (the effect of an educational design based on interactive electronic activities on the contemplative thinking of fourth-grade students in physics), where the research followed the experimental method, and the research sample consisted of two groups, one of which was a control group that was taught in the usual way, and the other experimental, which was studied according to The educational design, and the number of the sample was (86) female students distributed into two control groups (43) students and an experimental group (43) female students. By building a reflective thinking scale, and the results of the research showed that there was a significant difference between the mean scores of the control group that was studied using the usual and experimental method, which was taught by educational design based on interactive electronic activities for the benefit of the experimental group, and on the basis of the results that appeared, the researcher made a set of recommendations.

**Keywords**---educational design, students, electronic activities.

## **Chapter One: Introduction to Research**

### **Search problem**

As a result of the rapid technological developments taking place in the field of science in general and physics in particular, it is necessary to develop teaching methods and choose appropriate teaching methods and tools to keep pace with

this development in order to connect students to better results in the level of achievement.

In order for learners to think and reflect on the new educational materials that are presented to them or any study topic, the teacher must give part of the time for the learners to work on thinking about this material and reflecting on it. In-depth information or questions, and this has been confirmed by many educators and specialists because of the importance of this type of thinking, especially in practical and personal life. (1971:33, Tyler)

To confirm the research problem, the researcher worked on providing an exploratory questionnaire to a sample of male and female physics teachers, consisting of (5) questions as shown in Appendix (1).

### **Research importance**

The process of achieving learning goals requires defining the activities through which those goals are achieved, so that the end of the education process is marked by success, effectiveness and efficiency stemming from the learners reaching the maximum extent in achieving the goals. This is due to the selection of educational activities from which the learner reaches the level of acceptable achievement in the shortest possible period of time. (Mansi, 1997: 54)

### **He identified the importance of interactive electronic activities as follows:**

Many psychologists and educators have emphasized that the main goal in teaching science in particular and physics in general is to teach students the thinking process and not to memorize the educational material and curriculum by heart without understanding and absorbing what they learn. The learning process through the use of modern methods of teaching and interactive electronic activities. (Zaytoun, 2005: 22)

### **Research Objectives:**

The current research aims to:

- 1) Building an educational design based on interactive electronic activities for the fourth grade science physics subject
- 2) Knowing the effect of educational design based on interactive electronic activities on the contemplative thinking of fourth-grade students of science.
- 3) There are no statistically significant differences at the level (0.05) between the average scores of the experimental group students who will be taught by the educational design based on interactive electronic activities and the average scores of the control group students who will be taught according to the usual method in the reflective thinking scale.

### **The limits of the research:**

The limits of the research were limited to:

- 1) Humanity: fourth-grade students of science in government secondary and preparatory schools of the General Directorate of Education in Al-Qadisiyah Governorate for the academic year 2022/2021.
- 2) Temporal: the second semester of the academic year (2021-2022).

- 3) Location: Al-Kawakib Secondary School for Girls - Al-Shamiya District - Al-Qadisiyah Governorate.
- 4) Cognitive:
  - Building an educational design according to interactive electronic activities and measuring its impact on the reflective thinking of fourth-grade students in physics.
  - Classrooms (fifth, sixth, eighth, ninth) according to the adaptation of the Iraqi Ministry of Education for the current academic year from the physics textbook for the fourth scientific grade / 11th edition for the year (2022-2021).

## **Define study terms**

### **1- Instructional Design**

It is defined (Saraya, 2007): It is a system that aims to define a standard for selecting the best sources, methods and methods for learning and creating the educational environment in order to be able to improve educational outcomes according to a set of conditions applied to a sample of learners based on their abilities and cognitive knowledge, planning and implementing it in the educational process to achieve Desirable goals of education. (Saraya, 2007: 24)

**Define design (Kemp, 1985):** It is the process of practicing education by choosing a specific goal or goals and arranging the educational material in the form of steps through the use of advanced technological methods and methods in order to enable the learner to solve the problems facing him and reach the achievement of the goals that have been identified. Kemp, 1985: (4:4)

### **The researcher defines it procedurally as follows:**

It is a sequential and organized procedure that was built by the researcher according to the interactive electronic activities and based on sequential steps in the teaching of physics for the fourth scientific, the purpose of which is to achieve the goals that have been set for the students of the fourth scientific grade to improve the achievement of the students and develop their contemplative thinking.

### **2- Interactive electronic activities:**

It is defined as follows:

**Knew it (Al-Halfawi, 2011):** It is a set of experiences that attract the learner's attention and interests by diving into educational situations, when these activities are interspersed with educational applications and practices, as well as stimulating thinking and any other emotional, cognitive or skill activity, guiding and directing learners by the teacher and providing them with nutrition feedback that corrects misunderstandings and avoids it. (Al-Halafawi, 2011: 78)

Interactive electronic activities were also defined as all that the student is expected to do after the input he received, such as listening, watching or reading, as it is a response to the educational content he provides. (Prophy & Allemman, 1991: 23)

**The interactive electronic activities were defined by the researcher as follows:**

**Procedurally:** It is an organized interaction between the elements of the educational process from the learners and the teacher and the means, techniques and devices that the researcher worked on preparing and using in the teaching process through the design of interactive electronic activities such as educational programming and the virtual laboratory (crocodile physics) in order to improve the levels of students.

### **3- Reflective thinking**

Jordan Helvash and Philip Smith defined it as: a belief (desire) or a plan for a specific action, and this type of disciplined thinking is controlled by the mind for the purpose of solving a problem, and individuals have different levels of contemplative thinking. (Helvash and Philip, 1963: 3)

Reflective thinking was defined by (Al-Qawasmeh and Abu Ghazala, 2013) as the process of helping the individual to solve scientific problems and extract knowledge in a new way, which facilitates access to the experiences desired to be achieved in the future through a systematic, careful and conscious investigation of his knowledge, capabilities and beliefs while working in it. . (Qawasmeh, and Abu Ghazla, 2013: 150)

The researcher adopted the definition of Qawasma and Abu Ghazla as a theoretical definition.

**The definition of the researcher procedurally:** It is the extent to which the students of the fourth scientific grade are able to solve the academic problems that they encounter in the classroom through the school's use of interactive electronic activities in the teaching process.

## **Chapter Two**

### **Theoretical Background and Previous Studies:**

#### **I. Theoretical background:**

Instructional design from a constructivist viewpoint

When talking about educational design according to the constructivist theory, it is self-evident that both the behavioral and cognitive theory stand behind it, as the changes that occur in behavior are among the behavioral concerns, as the constantly repeated behavioral model corresponds to the cognitive automatically that emphasizes the cognitive and mental aspect behind the behavior What appears on the educated individual, and constructivism considers what is learned by the teacher to be meaningful learning, and constructivism works to develop the learner so that he can solve the educational problems he faces. (Mazen, 2015: 39)

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

1. One of the principles that has a major role in developing and increasing the educational effectiveness of design are theories related to (motivation, growth, learning).
2. Instructional design principles must be used in the learning process.
3. Criteria for selecting the appropriate teaching aids for the educational lesson must be observed.

4. In order to choose the appropriate teaching strategy, individual differences and the characteristics of learners must be taken into account.
5. Design is considered a part of the technical field of education and interacts with the rest of the other elements of it. (Grey, 2016: 157)

### **Instructional design templates**

The model for instructional design (Khamis, 2003) quoting from Attia (Atiya, 2009) is defined as an abstract mental process that shows the steps and processes used in instructional design, finding the interactive relationship between them and developing them, working to direct this process, and finding and evaluating the new generated relationships.

### **A good instructional design model has a number of characteristics, including:**

Simplify the concepts that are presented on the ground and facilitate their assimilation by explaining their operations on the ground.

The interaction between all the elements without the presence of contradictions between them.

It is characterized by galactic concepts and symbols despite its representation on the ground.

Minimizing educational relationships and processes as much as possible. The possibility of generalizing the operations of each model in other fields. (Atiya, 2009: 63)

### **The models are categorized into the following:**

Foreign models	Arabic models	T
ADDIE model	Hassan Zaitoun(1999)	1
Clark and Starr(1981)	The Meshaqih Instructional Design (1989)	2
Dick and Carrie (1996)	Muhammad Khamis (2003)	3
Wong and Rawson(1974)	Zainab Amin (2000)	4
Kemp(1985)	Instructional Design Hassan Al-Tobji (1985)	5
Circe and Lowenthal	Ali Abdel Moneim(1998)	6
Carvel	The Butcher (1992)	7

(Saraya, 2007: 67-90)

### **ADDIE generic model:**

It is a procedural system for the educational design process that makes the educational outputs efficient and effective to achieve what the design was set for, and provides the designer with design construction procedures, and is characterized by ease of application and effectiveness. And the general model (ADDIE) means the abbreviation for the first letters of the words (Analyze, Design, Develop, Implement, Evaluate), which are the five stages of designing the general model and it is considered as a single template for all models, all of which are united by the five stages of the general model with some differences between the models The other in terms of development in certain stages, which is the cornerstone of the systems curve. (Sherman, 2015: 62)

### **Interactive electronic activities**

The relationship between educational content and the interactive electronic activities followed

#### **Activities promote content by:**

- 1- Learners' interest in the curriculum and increase their motivation.
- 2- Make the information more stable and effective over a long period of time.
- 3- Opening horizons towards individual and collective activities.
- 4- Finding the opportunity to add new experiences to the curricula. (Al-Tanawi, 2009: 43)

### **Interactive electronic activities used in research**

The activities that have been selected to teach physics for the fourth scientific class during this research are:

#### **First: Crocodile Physics Virtual Laboratory**

It is a simulation program to carry out physical experiments related to all fields of physics. It is an imaginary laboratory through which the teacher as well as the learner can modify the variables of the experiment by increasing or decreasing it and observing the resulting effect by himself according to his knowledge and ability, and by this he simulates the experiment himself with colors, movements and sounds so that the student can repeat the experiment several times Until he learns it and gets its results and graphs. (Gatet, 2015: 275)

#### **Crocodile physics features**

- 1- Distinguished and new educational information that cannot be acquired from traditional laboratories.
- 2- It makes the physical theory closer to reality, that is, explains it in a simplified manner.
- 3- The user can save his experiences to know the level of accuracy of his performance.
- 4- It is possible with ease and ease to walk in experiments with electrical and mechanical subjects, forces, sounds, movement, vibrations and light.
- 5- Enjoy watching the performance of the experiment with sound and motion effects. (Al-Hazzami, 2010: 20)

#### **Second: educational software**

(Atiya, 2008) defined educational software as the process of displaying educational materials programmed by the computer, as well as including all educational lessons that are reviewed by computer programs such as PowerPoint, and the emergence and spread of educational software helped design and programming educational content in programs that are accurate, quality and based on principles Effective learning, and this software works to excite the learner and is more effective and more considerate of the characteristics of students, including individual differences. (Atiya, 2009: 133)

#### **Educational software standards:**

In order for educational software to be good, the following criteria must be taken into account when designing and producing it:

- a) Pre-test: It is the process of identifying learners' information by the teacher so that he can know the point from which the application of the software begins.
- b) Getting to know the educational software: It is the process of introducing the people responsible for preparing the educational software and its design on the goals, the work team and the design. This definition is done through attractive images that are related to the topics of educational programming.
- c) Activities used in educational software: The educational activities are among the main points of the software and have a significant impact on the learner's acquisition of information, concepts and trends if they are well directed, as well as the activities (such as memorized, issues, assignments, and exercises) must be mixed with activities such as (Responding to the questions asked, reading, listening).
- d) Transition effects through topics: It is the use of a group of images, animations, video clips, various shapes, and different screens that attract learners when viewing the software.
- e) Teaching aids and educational material: When designing the software, it must be taken into account that the software is supported by some illustrative maps and educational videos, as well as taking into account individual differences. (Mahmoud, 2009: 127)

#### **The strategy used for teaching through interactive electronic activities: blended learning strategy**

In order to keep pace with developments in the field of education to search for new strategies, and with these developments and progress, traditional methods of education cannot be dispensed with, and we cannot make e-learning abolish the role of the teacher and be a substitute for traditional learning and the absence of traditional classrooms, so the necessary measures must be taken to get out With decisions that can benefit from technical transformations in education and get out of it with new strategies that take into account traditional learning and integrate with it electronic learning, thus the concept of blended learning emerged. (Atiya, 2009: 100)

#### **Blended learning concept**

The concept of blended learning is not old, but rather its roots extend from ancient times to the present, that is, it is a term (old and new), which means merging technology with educational methods and strategy, but there is no specific strategy for integration, but rather depends on the skills used to mix different tools and methods in a coordinated manner. and harmonious, where successful blended learning is like a successful musical score or an excellent cooking recipe where this learning is properly integrated depends on the amount of materials and methods being incorporated. (Al-Sous and Abu Musa, 2012: 5)

**(Bliuc, 2007)** defines gradual learning as an educational activity in which face-to-face interaction (traditional teaching) is combined with interaction between teacher and learner using modern technology. (Bliuc, 2007: 234)

### **Basic principles of instructional design based on a blended learning strategy**

- 1- The main purpose of introducing technology into the educational process is to make more use of technology in achieving educational goals, as technology in this case serves education.
- 2- Taking into account the students' needs and tendencies by making use of the use of the traditional learning environment and integrating it with the virtual learning environment, i.e. mixing classroom learning with computer-based learning.
- 3- The role of both the teacher and the learner is changed during the course of the lesson through blended learning, and thus there is a shift in the theories, principles and concepts of learning, i.e. there is an expansion in the use of different forms of learning. (2009:29, Adams et. al)
- 4- The results of the educational process are constantly monitored through continuous evaluation, which leads to maintaining the quality and quality of education. (2006:140, Vaughan & Vaughan)

### **2- Reflective thinking**

#### **Reflective thinking skills:**

As a result of the researcher's review of a number of previous studies, she concluded that most of the studies relied on five skills related to reflective thinking, which are as follows:

#### **First, visual vision**

It is the process of revealing the relationships between the components of the subject visually through the nature of the concept or by presenting shapes or drawings that illustrate it, so that the aspects of the concept and its elements can be presented.

#### **Secondly, detecting inaccuracies**

Knowing the differences, dissimilar qualities, or the incoherent and not logical relationship leads to knowing the gaps in the concept.

#### **Third, drawing conclusions**

By presenting the content of the concepts, the educational materials, presenting the similarities and reaching consistent results in the topics of the educational situations, logical relationships will be reached.

#### **Fourth, give convincing explanations**

As a result of relying on the previous information and the characteristics and nature of the topic presented, there will be a meaning of the linking relationships and a logical meaning of the results will be provided.

#### **Fifthly, providing suggested solutions**

It is the ability to follow logical steps based on expected mental visualizations in order to find solutions to the problems presented. (Qawasmeh and Abu Ghazla, 2013: 43)

#### **Previous studies: The previous studies varied in terms of objectives, including:**

**First**, a study (Al-Hadabia and Al-Saeedi, 2015) aimed at (to know the effect of using the McCarthy model in developing reflective thinking and the achievement of science among sixth-grade students), (55) female students, and the study sample consisted of two groups, one control and the other experimental, and the thinking test was used. Reflective and achievement test for science subject in

order to achieve the goal of the research, as well as use the arithmetic mean, standard deviation and the Eta square in order to reach the following results: McCarthy's model helps to acquire higher levels of learning such as application and inference.

**Second** / study (Taha and Al-Kilani, 2018) The study aimed to (recognize the effect of the cognitive modeling strategy in developing reflective thinking and scientific trends towards science among fifth-grade students in the State of Kuwait), and the study sample consisted of (43) male and female students distributed into two groups, one of which is Controlled and the other experimental, and the reflective thinking scale and the scientific trends scale were used in order to achieve the goal of the research, and the statistical analysis program for the social sciences (SPSS), arithmetic averages, standard deviation, and covariance analysis were also used to reach the following results: The cognitive modeling strategy is more effective than the usual method in developing students' reflective thinking.

### **Chapter Three:**

#### **Research Procedures and Methodology building instructional design**

Building an educational design according to interactive electronic activities requires five stages (analysis stage, design stage, development stage, implementation stage, evaluation stage) and the researcher in this research has approved the stages of the general model (ADDIE) and its steps can be summarized as follows:

#### **First: The Analysis stage**

This stage also includes determining the available human and material capabilities and the necessary materials, defining the characteristics of learners, their needs, preparations, abilities, tendencies, motives, and general and specific goals that should be achieved. (Mazen, 2015: 16)

The researcher conducted the analysis phase according to the following steps:

1\_ Defining and analyzing educational goals: The general goals of teaching physics for the fourth scientific stage are determined and analyzed to adapt to research and are classified into three areas (cognitive, skill, and emotional).

2\_ Determining the study subject: The study material for the last four semesters of the second academic course has been determined from the physics book for the fourth scientific grade, and due to the outbreak of the Corona epidemic, the seventh chapter has been deleted from page (114\_132) for the second academic course according to the adaptation of the Iraqi Ministry of Education for the academic year (2021-2022) , i 11 for the year 2021 as in the following table:

Table (1) chapters of the fourth scientific physics book for the second semester

Number of chapter pages	Chapter title	Semester	T
94-84	Light	Fifth	1
113-95	Reflection and refraction of light	Sixth	2
155-133	thin lenses	Eighth	3
186-156	static electricity (stable)	ninth	4

3\_ Determine the target group: Analysis of the target group , The target group has been identified as fourth-grade students of science in secondary and preparatory schools affiliated with the Iraqi Ministry of Education for the academic year (2021-2022) AD after the procedures for facilitating the task were completed in order to apply the research experience.

4- Analysis of the educational environment: Analysis of the educational environment Where it is carried out through a visit to a number of government secondary and secondary schools affiliated to the Directorate of Education Al-Qadisiyah, and the Al-Kawakib Secondary School for Girls - Al-Shamiya District was chosen.

5- Analysis of the characteristics of learners: The instructional design must be familiar with the characteristics of the students in order to achieve the original objective of the instructional design.

6- Analysis of educational content: Analysis of educational content: The content analysis process resulted in the last four chapters of the fourth-grade physics book, which was carried out by the researcher and organized in order to comply with the educational design. The main and subsidiary physical concepts were written in a list and presented to a number of specialists in teaching a subject Physics, and its validity was agreed upon in Appendix (2).

#### **Analysis of the educational needs of the target group: Analysis of the educational needs**

- For the purpose of determining the educational needs of the target group, the researcher took the following steps:
- From the teachers' point of view: The researcher directed an open-ended exploratory questionnaire, Appendix (3), consisting of (25) paragraphs to express their opinion on the needs of the fourth scientific students, which they believe are important.
- From the learners' point of view, A questionnaire was prepared by the researcher, consisting of several paragraphs represented in Appendix (6), and it was directed to a sample consisting of (100) fourth-grade students who studied physics in the previous year for the academic year (2020-2021) and distributed into (25) items. In order to determine the educational needs of students.

#### **Analyze the characteristics of learners:**

The instructional design must include the characteristics of the students in order to focus on achieving the original objective of the instructional design.

#### **Second / the design stage**

The design is carried out according to the following steps:

- 1- Formulation of behavioral objectives: The researcher has prepared (120) behavioral objectives on the following levels of Bloom's classification (remembering, understanding, applying, synthesis, analysis, evaluation) as in Appendix (7), in line with the target group and the nature of the content.
- 2- Distribution of the scientific material to the daily lessons: The classes for the second academic course were distributed according to the adaptation of the Iraqi Ministry of Education due to the Corona pandemic into two weekly

- classes, so the total number of classes was (17) classes for the second semester. It was (15) portions.
- 3- Preparing the research requirements: it includes preparing and preparing the techniques, educational activities and materials suitable for the lesson available within the environment and available in the school laboratory, including tools, equipment and devices.
  - 4- Choosing a teaching strategy When choosing an appropriate teaching strategy, the researcher reviewed a number of previous studies and literature, and the strategy was chosen that suits the interactive electronic activities, which depend mainly on students' activity. ).
  - 5- Preparation of the study plan: The researcher prepared (30) plans for the two research groups in order to apply it to a sample of students, including (15) plans for the control group that is taught in the traditional way, and (15) plans for the experimental group that is taught by educational design according to electronic activities Interactive, and some modifications were made to it to be finalized as in Appendix (8) and (9). On the basis of these plans, the same method was followed to prepare other plans that are relied upon during the period of conducting the experiment on female students.
  - 6- Research tools: One of the research requirements is the preparation of the reflective thinking scale:
    1. Objective of the scale
    2. A list of reflective thinking skills
    3. Formulating the items of the scale: The reflective thinking scale was built by the researcher, and it consists of (35) objective items that include the previously mentioned reflective thinking skills. (very few) and the student chooses one of these alternatives, and it includes information specific to the students, the purpose of the scale, the number of its items, and how to answer the items of the scale, Appendix (10)
  - 4- Validity of the scale: One of the conditions for a good test is the scale's ability to measure what it was designed to measure, i.e. it has a close relationship with the ability it measures. (Al-Bawi and Al-Shammari, 2020: 235)  
The scale was presented to the arbitrators as in Appendix (4) in the curricula and methods of teaching science, and the opinion of the arbitrators was agreed upon after some of its paragraphs were amended with a percentage greater than (80%) about the appropriateness of the statements from a scientific point of view and their connection to physics, and thus the apparent honesty was investigated. The truth of the content.
  - 5- Applying the reflective thinking scale to a first exploratory sample:  
The scale was applied in its initial form on a sample of fourth-grade students of science (a sample that differs from the basic research sample) Appendix (11) in (Al-Khansa Preparatory School for Girls), whose number of students is (30), and after correcting the scale, the following was calculated:
    - A. Determine the response time on the scale:
    - B. Ensuring the clarity of the instructions of the scale and the clarity of the paragraphs:
  - 6- Applying the scale to a second exploratory sample  
The researcher applied the scale in its initial form to a second exploratory sample consisting of (100) female students from Al-Khansa Preparatory School

for Girls - Al-Shamiya District of the Al-Qadisiyah Education Directorate on February 15, 2022 in order to calculate the statistical characteristics.

### **Statistical analysis of the items of the scale:**

The researcher corrected the female students' answers to the exploratory sample on the scale items, and arranged the scores in descending order in order to conduct the statistical analysis, and (27%) of the papers with the highest scores (35) students were chosen to represent the highest category and (27%) of the papers with the lowest scores. And the amount of (35) female students in the lower category, and according to the opinion of (Abu Libdeh, 2008), if the sample size is (100) and above, a percentage (27%) is adopted for the upper and lower groups. (Abu Libdeh, 2008: 309)

### **Calculation of the discriminatory power of the scale: Appendix (12).**

#### **Calculation of the scale's stability coefficient:**

Using the (Cronbach's alpha) method, and through the survey sample scores, it turned out that it is equal to (0.944) as in Appendix (13), and this indicates that the scale has high stability and is suitable for measurement purposes.

**Structure validity:** To calculate the construct validity of the scale, the correlation coefficient of the degree of each item of the scale must be calculated with the total score of the dimension to which it belongs (Appendix 14), and also the correlation coefficient between the score of each item with the total score of each skill of the Supplemented Thinking Reflection Scale (15) ), and also calculating the correlation coefficient between the degree of skill and the total score of the attached reflective thinking scale (16) and it was found that the correlation coefficients are positive and statistically significant, which indicates the validity of the reflective thinking scale and it became composed of (35) items and can be applied to the original research sample.

#### **Third / development stage:**

At this stage, effective teaching design and training are translated into real educational materials, strategies for their presentation, the necessary teaching aids, the organization and accompanying activities, and the evaluation process, including the development process (developing the educational environment, developing teaching strategies, developing teaching plans, preparing educational activities). (The Resource, 1999: 25)

#### **Fourth: The Synthesis Stage:**

At this stage, procedures are used to implement the educational design based on electronic educational activities through its experiment on the basic research sample, and it includes the following procedures:

#### **Experimental design of the research:**

The researcher chose a design with two equal groups with partial control, one experimental and the other control, as in Table (2).

Table (2) The experimental design of the research (prepared by the researcher)

Dependant variable	Independent variable	Parity for groups	Group
Achievement	Instructional design based on interactive electronic activities	<ul style="list-style-type: none"> <li>- Age</li> <li>- Intelligence</li> <li>- Previous information test</li> </ul>	Experimental
	normal method		Controller

**Research community:** The research community includes all fourth-grade students studying physics for the second semester of the Qadisiyah Education Directorate for the academic year (2021-2022), from government day schools.

**The research sample:** Al-Kawakib Secondary School for Girls, affiliated to the Al-Qadisiyah Education Directorate, was chosen for the academic year (2021-2022) AD. Its number was (86) students divided into two divisions, and through a random lottery, class (B) was chosen to represent the control group and Division (A) with 43 students for each group.

**Procedures for controlling variables:** Before starting the research experiment, the researcher controlled some variables that could affect the results of the experiment through the following steps:

**Internal safety of the experimental design:**

The internal safety in the experimental design includes the validity of the research results to the extent that the difference between the results of the experimental and control group that is affected by the independent variable and not to extraneous factors can be attributed to it. (Habib, 2000: 23) Therefore, after the research sample was selected and divided into two groups (control and experimental), the researcher performed a number of procedures in order to verify the internal safety, through which the following factors were addressed:

**Equivalence of the two research groups:**

In order to be equivalent to the two research groups, the researcher adjusted the factors (chronological age calculated in months, Appendix (17), intelligence, the Lautis-Lignon intelligence test was applied, Appendix (17), previous information for physics: The researcher prepared a test of the previous information and relied on physics for the intermediate stage in its formulation. And the first course material for the fourth grade science supplement (17).

**The integrity of the external experimental design:**

it is the extent to which the experiment members represent the research community to which they belong and the extent to which the results of the experiment can be generalized to the research community in the same conditions and procedures. To conduct the experiment, the confidentiality of the experiment, the physical conditions, the distribution of rations on the days of the week, the procedures for applying the experiment (research).

**Fifthly, the evaluation stage.**

It is the last stage in the instructional design and is considered one of the important parts in which the research is evaluated on the extent to which the desired goals have been achieved.

**1- Preliminary assessment:** In this type, the assessment is presented at the beginning of the educational design process through the researcher's dependence on the intelligence scale, and testing the previous information of the fourth-grade students in order to establish parity between the two research groups, as well as

submitting a questionnaire to one of the study plans to a group of arbitrators (Appendix 4) ) to take their opinions and directions for use in building other plans.

**2- Constructive evaluation:** This type is carried out during the process of constructing the educational design, as it is an inherent process that continues from its inception until it reaches its final form by providing feedback on the process of constructing the design to change the weaknesses and enhance the positives through daily and monthly tests of the sample.

**3- Final evaluation:** This evaluation takes place upon completion of the process of constructing the instructional design, and its objective is to verify the effectiveness of constructing the instructional design in achieving the research objectives. (Sherman, 2015: 57)

Where the researcher relied on applying the achievement test on the research sample after completing the teaching of the scientific material, in order to measure the effectiveness of the educational design by obtaining the test results that will be presented in detail in the fourth chapter.

#### **Chapter Four:**

##### **Discusses the Results, Conclusions and Recommendations**

##### **First/ Presentation and Interpretation of Results:**

The results will be presented according to the research objectives as follows:

**The first goal:** which stipulated (to build an educational design based on interactive electronic activities for the fourth grade science physics subject), and this goal was verified through what was presented in the third chapter (research procedures and methodology) of the steps and procedures for building educational design.

**Secondly,** the third goal states **(to know the effect of educational design based on interactive electronic activities on the contemplative thinking of fourth-grade students of science).**

The answer sheets for the students of the research sample for the control and experimental groups were corrected in the concept acquisition scale and were arranged in the appendix lists (18), and the average scores and standard deviation of each of the two groups were calculated. next:

There are no statistically significant differences at the level (0.05) between the average scores of the experimental group students who will be taught by the educational design based on interactive electronic activities and the average scores of the control group students who will be taught according to the usual method in the reflective thinking scale.

In order to verify the hypothesis, the researcher used the t-test for two independent samples through the statistical package Spss, in order to show the significance of the difference between the average scores of the two groups, as shown in Table (3).

Table (3) results of the t-test for two independent samples of the two research groups on the reflective thinking test of the experimental and control group

Statistical significance at the 0.05 . level	T value		Freedom Degree	Contrast	Standard deviation	SMA	Number of female students	Group
	Tabular	Calculated						
Significant	2,03	3,096	84	1219,75	34,92	96,77	43	Experimental
				1153,47	33,96	73,77	43	Controller

From table (3), it was found from the arithmetic mean, and the calculated t-value (3,096), which is greater than the tabular t-value of (2,03) at the degree of freedom (84) and the level of significance (0.05), that is, there is a statistically significant difference in favor of the experimental group. in the reflective thinking scale.

In order to confirm the effectiveness of the educational design based on interactive electronic activities, and in order to calculate the effect size of the independent variable in the dependent variable, the researcher adopted the effect size equation (d), for the independent variable in the dependent variable, in Table (4).

Table (4) the effect size of the independent variable in the reflective thinking test variable

The amount of the effect	The value of the effect size D	Dependant variable	Independent variable
Average	0,68	reflective thinking scale	Instructional design based on interactive electronic activities

According to Cohen's (1988) classification, the values of the effect size and the effect size are (0.2-0.4) small, (0.5\_0.7) medium, and (0.8) and above large. (Gravetter & Wallnau. 2013: 26)

This explains that the value of the effect size when applying the educational design based on interactive electronic activities on the dependent variable interactive electronic activities amounted to (0.68), and this value shows that the effect size is a medium percentage in the research sample (the experimental group).

### **Second / Conclusions:**

On the basis of the research results, the researcher reached a number of conclusions as follows:

- 1- The effect of instructional design based on interactive electronic activities in increasing the reflective thinking of fourth-grade female students (the experimental group).
- 2- Relying on the educational design based on interactive electronic activities in teaching the students of the experimental group had a role in improving the

students' ability to carry out the duties and activities in an easy and smooth manner, and increasing their thinking in a distinctive way, while this was difficult for the control group who studied in the traditional way.

3- The instructional design based on interactive electronic activities helped the students of the experimental group to organize their ideas in a sequence from the previous information and then the acquired information. control group.

4- It is possible to use the educational design based on interactive electronic activities by teachers in teaching physics.

### **Third / Recommendations:**

Based on the results of the research, the researcher recommends the following:

1- The design based on interactive electronic activities can be used in teaching physics for the preparatory stage, because it has an impact on improving the achievement of physics.

2- It is important to develop reflective thinking among students and for all academic levels, which is important in making students more able to identify problems and find solutions to them on time.

3- It is necessary to train students in faculties of education and prepare them on how to apply educational design and modern strategies based on interactive electronic activities and include them in the vocabulary of relevant educational materials.

4- It is important to take into account the educational needs of students in order to be analyzed because of their important role in eliminating the difficulties associated with the process of teaching physics.

5- It is necessary to provide education and the Directorate of General Curricula (curricula experts) with information on the importance and role of electronic activities so that this can be taken into account when designing and planning curricula.

### **Fourth / Suggestions:**

In order to complete the topic of the current study, the researcher suggests the following:

1- To conduct research similar to the current research in other disciplines, biology, mathematics and chemistry.

2- Studying the construction of educational design based on the dimensions of interactive electronic activities in other variables such as scientific thinking, systemic thinking, problem solving, and developing mind skills.

3- Conducting a study of the impact of teaching by integrating interactive electronic activities within educational content with other variables.

4- It is possible to conduct a comparative study between the educational design based on interactive electronic activities with other educational designs according to educational programs and other methods

### **References**

1. Abu Libdeh, Sabaa Muhammad (2008): Principles of Psychometrics and Educational Evaluation, 1st Edition, Dar Al-Fikr for Publishing, Amman.
2. Adams, J. M. Hanesiak, R. Morgan, G., Owston, R., Lupshenyuk, D., & Mills, L. (2009): Blended learning for soft skills development Testing a Four- Level

- Framework for Integrating Work and Learning to Maximize personal practice and Job Performance Institute for research on Learning Technologies.
3. Al-Halfawi, Walid Salem (2011): E-Learning: New Applications, 1st Edition, Dar Al-Fikr, Cairo.
  4. Al-Hawamdeh, Ahmed Mahmoud (2019): Strategies for Dealing with Learning Difficulties, 1st Edition, Dar Ibn Al-Nafis, Amman.
  5. Al-Hazmi, Doaa Bint Ahmed (2010): Virtual Laboratories in Science Education, 1st Edition, Al-Rushd Library, Riyadh.
  6. Al-Natawi, Effat (2009): Effective Teaching: Planning - Skills - Strategies - Evaluation, Dar Al Masirah for Publishing and Distribution, Amman.
  7. Attia, Mohsen Ali (2009): Modern Curricula and Teaching Methods, 1st Edition, Curriculum House for Publishing and Distribution, Amman.
  8. Attia, Mohsen Ali (2013): Modern Curricula and Teaching Methods, 1st Edition, Curriculum House, Jordan.
  9. Azmy, Nabil Gad (2001): Instructional Design for Multimedia, 2nd Edition, Dar Al-Huda for Publishing and Distribution, Egypt.
  10. Bliuc, A. M., Goodyear, p., & Ellis, R. (2007): Research focus and methodological choices in studies into student experiences of blended learning in higher education, *Internet and Higher Education*, p. 231–244.
  11. Brophy, J., & Alleman, J. (1991): Educational researcher, Activities as instructional tools framework for analysis and evaluation, p.23.
  12. Gravetter, Fredrick, J., Wallnau, Lavry, B. (2013): *Statistics for the Behavioral Sciences*, 4th Ed, Cengage Learning, Canada. - Leona, E, Tyler(1971): *Tests and Measurements*, 2nd edition, Englewood Cliffs, New Jersey, prentice-Hall, Inc.
  13. Habib, Magdy Abdel Karim (2000): *Evaluation and Measurement in Education and Psychology*, 1st Edition, Egyptian Renaissance Library, Cairo.
  14. Helfish, Golden, and Smith, Philip, translated by Mr. Muhammad Al-Azzawi (1963): *reflective thinking*, Dar Al-Nafais for printing, Cairo.
  15. Jerry, Khudair Abbas (2016): *Educational Techniques (Development. Classifications. Types. Trends)*, 2nd Edition, Jaafar Al-Asmy for Printing and Binding, Iraq.
  16. Kemp, Jerrold. E. (1985): *The instructional design process*, New York, Harper and Row.
  17. Khan, Badr, translated by Ali bin Sharaf Al-Moussawi and others (2005): *E-learning strategies*, Shuaa Publishing, Syria.
  18. Mahmoud, Shawky Hassani (2009): *Curriculum Development A Contemporary Vision*, 1st Edition, The Arab Publishing Group, Egypt.
  19. Mansi, Hassan Omar (1997): *Teaching Design*, Dar Al-Kindi, Egypt.
  20. Mazen, Hossam El-Din (2015): *Effective Teaching Design Technology (Between Thought and Application)*, i 1, Dar Al-Ilm wa Al-Iman, Egypt.
  21. Qawasmeh, Ahmad Hassan, Abu Ghazla, Muhammad Ahmad (2013): *Developing the skills of learning, thinking and research*, 1st Edition, Dar Safa Publishing, Amman.
  22. Quteit, Ghassan Yousef (2015): *Modern Learning and Teaching Techniques*, 1st Edition, House of Culture, Amman.
  23. Rakhmonov, O. M., Shadmanov, A. K., & Juraev, F. M. (2021). Results of endoscopic treatment of benign prostatic hyperplasia in patients with metabolic syndrome. *International Journal of Health & Medical Sciences*, 5(1), 21-25. <https://doi.org/10.21744/ijhms.v5n1.1811>

24. Saraya, Adel Muhammad (2007): *Instructional Design and Meaningful Learning*, 2nd Edition, Wael Publishing House, Amman.
25. Sharman, Atef Abu Hamid (2015): *Blended and Flipped Learning*, 1st Edition, Dar Al Masirah, Amman.
26. Suryasa, I. W., Rodríguez-Gámez, M., & Koldoris, T. (2022). Post-pandemic health and its sustainability: Educational situation. *International Journal of Health Sciences*, 6(1), i-v. <https://doi.org/10.53730/ijhs.v6n1.5949>
27. *The trick*, Muhammad Mahmoud (1999): *Instructional Design Theory and Practice*, 1st Edition, Dar Al Masirah, Amman.
28. *The trick*, Muhammad Mahmoud (2014): *Educational technology between theory and practice*, 9th edition, Dar Al Masirah, Amman.
29. Vaughan, N. D., & Vaughan, N. D. (2006): How Blended Learning Can support a faculty development community, *journal of Asynchronous Learning Networks*, (10)4, p. 140.
30. Zaytoun, Ayesh Mahmoud (2005): *Methods of Teaching Science*, 1st Edition, Dar Al-Shorouk, Amman.