

"Designing an Electronic Learning Environment based on the Relational Theory in Acquiring Chemical Concepts when Students Fifth Grade Bio"

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Abstract:

The research aims to identify the design of an electronic learning environment based on the associative theory in acquiring chemical concepts and technological awareness among fifth-grade biology students. 33) female student, and in a random drawing method, the researcher chose (Umm Al-Muminin high school for girls) from the research community represented by secondary and middle schools affiliated to the Directorate of Education of Babil Governorate/ Kothi District. And two dependent variables (acquisition of chemical concepts, measure of technological awareness), as the researcher chose the experimental design to control the research variables. of intelligence, the technological awareness scale), and after making parity between the two research groups, the researcher prepared the requirements of the study An application of plans, goals and tests for the two research groups, and after the completion of the experiment, the researcher applied her research tools to the two research groups. The experimental group on the control group students in acquiring chemical concepts and the technological awareness scale.

key words :Electronic educational environment, acquisition of chemical concepts, technological awareness, fifth grade biology students

chapter one

Introducing the search

First, the research problem:

The research problem is that the teachers do not have knowledge of electronic environments and how to design and deal with them according to the associative theory ;In addition, the teaching of chemistry is still taught by methods and methods based on memorization, indoctrination and recitation of the learner, so the learner did not have a role in the educational process, but rather just a future for information and knowledge, as well as the lack of interest in technological awareness among the biological sciences fifth grade students, and the reason is due to the lack of Encouraging school administrations and teachers to use computer laboratories and electronic devices in teaching chemistry, which made the percentage of female students' awareness limited to no more than mobile phones and internet browsing.

Hence, the research problem emerged with the following question:

(Is the design of the electronic educational environment based on the associative theory an effect on the acquisition of chemical concepts and technological awareness among the fifth grade biology students).

Second: The importance of research:

Interest in various sciences has increased to keep pace with the aspirations of the age and its capabilities in preparing a generation capable of linking the types of knowledge that contribute to developing the ability to solve problems and form a correct understanding of concepts. By focusing on the functional applications of scientific knowledge in daily life, knowledge is no longer the primary goal of education, but rather the focus on developing students' problem-solving skills is the main goal (Abu Athra, 2010: 13).

The researcher believes that education faces great responsibilities and challenges in the formation of individuals who have the ability to keep pace with the progress of the age and face its problems and challenges, and this is not easy. Therefore, preparing young people has become at the forefront of the educational goals that nations aim to keep pace with the rapid cognitive and technological progress witnessed in life by all aspects of it.

Education has a major role in the life of nations because it is responsible for the integration of the individual's growth in all respects, i.e. mentally, spiritually, psychologically and healthily. It helps the individual to integrate with society and helps him to acquire skills, rules, ethics and customs that are in line with the society's philosophy, values and customs, and the advancement of the individual to become an effective member of society. (The Resource, 2014: 88).

Therefore, it is necessary to follow the latest educational methods and programs to develop the performance of learners and raise the level of the teaching profession, and from this standpoint, it is the responsibility of the teacher to choose the educational methods and programs that aim to reach the goal to be achieved, and his choice of effective teaching methods and programs depends on their suitability to the characteristics and needs of the learners and the nature of the academic content. and educational goals and the available material and human capabilities (Salama et al., 2009, 52).

Third: Research Objective:

The current research aims to identify the design of an electronic learning environment based on the associative theory and its impact on the acquisition of concepts and technological awareness of the fifth grade biology students.

Fourth: The two research hypotheses:

1. There is no statistically significant difference at the significance level (0.05) between the average degrees of acquisition of chemical concepts among the students (the experimental group) who will study according to the design of an electronic learning environment based on the associative theory, and the average degrees of acquisition of chemical concepts among the students of the control group who will study Same material in the usual way.
2. There is no statistically significant difference at the significance level (0.05) between the average degrees of technological awareness among the students (the experimental group) who will study according to the design of an electronic learning environment based on the associative theory, and the average degrees of technological awareness among the students of the control group who will study the same subject in the usual way.

Fifth: Limitations of Research:

The current search is limited to:

1. **Human Limits** :Fifth Grade Biology Students.
2. **Spatial boundaries** :all middle and secondary schools that are located in the education of Babylon / Kuthi district.
3. **Cognitive limits** :the chemical concepts contained in the content of chapters (third, fourth, fifth and sixth) of the chemistry book to be taught by the Ministry of Education, Republic of Iraq, formed by a committee from the Ministry of Education, the eighth edition of 2019/1440 AH.
4. **Time limits**)9(:weeks from the first course of the 2010-2021 academic year.

Sixth: Defining Terms:

1. Designed by:

1.(**Qatami, 2008**) says“ :Design is a drawing or a blueprint for a building, a road, or something else. As for the concept of design, idiomatically, it means engineering in a specific way and shape according to principles and foundations in which design elements are placed in a way that achieves its goals” (Qatami, 2008: 76).

The researcher defines procedural design as :a set of plans that the teacher sets and implements before the lesson plan on the experimental group to achieve educational goals or solve a specific problem.

2. An educational environment known by:

1.(**Zaytoun, 2005**) as“ :It is the climate surrounding the learning process” (Al-Zaytoun, 2008: 34).

The researcher defines the learning environment procedurally as :it is the place provided by the researcher to the students in which technological and technical means are available that affect the level of technological awareness and concept acquisition of the experimental group for research.

3. E-learning is known by:

1.(**Atiya, 2009**) as“ :A method that is followed with students in the classroom and depends on the use of electronic means in communication between the parties to the educational process” (Atiya, 2009: 43).

The researcher defines e-learning procedurally as: It is a new form of education based on the integration between traditional classroom teaching methods (explanation, discussion, scientific dialogue, practical lessons) and e-learning methods (computer, website, electronic programs, PowerPoint, projector, Magnetic discs, an educational electronic course) for chemistry for the fifth grade of biology.

4. Technological awareness was known by:

1.(**Kandil, 2004**) as“ :A set of ideas and information that a person possesses as a result of practice in technological and electronic work” (Kandil, 2004: 76).

The researcher defines technological awareness procedurally as :Acquisition then explains the chemical concept and shows its relationship with the concepts associated with it, and finally presents the concept to be learned in the form of practical applications with students to be properly acquired and developed.

5. Acquisition: Arafa each of:

1.(**Al-Salti, 2004**) that: “The formation of new associations ,if the inputs are uncorrelated, they will be only weak associations, but if the inputs are familiar, the aroused

associations will be strengthened, and the formation of associations depends largely on previous experience” (Al-Salti, 2004 .)104-103 :

The researcher defines acquisition procedurally as: the ability of the fifth grade biology students “the research sample” to define the chemical concept, distinguish it and the possibility of its application on the basis of the common properties between each concept within the three chapters of the chemistry book, as measured by the scores obtained by the students in the chemical concepts acquisition test prepared by the researcher. in advance.

.6The concept was defined by :

(.1Atiya, 2008) as“ :A group of things, symbols, objects, elements, or special events that are grouped on the basis of common characteristics or characteristics that are included in a specific category according to a specific criterion” (Atiya, 2008: 263 .)

The researcher defines the concept procedurally as :a group of names, symbols and terms that have a verbal significance that share distinctive characteristics that include the topics under discussion.

Chapter II

Theoretical framework and previous studies

The first axis: Theoretical framework:

First, the associative theory

The multiplicity of learning theories and their differences in the interpretation of the learning process, due to its complex and complex nature, which makes it difficult to realize a single point of view and provide a comprehensive framework for it, and the educational designer needs answers to multiple questions about the characteristics of learners, how they learn and the conditions that facilitate this learning and its conditions, The appropriate methods and procedures for its occurrence, and how to evaluate them, which are necessary questions for the design process and learning theories that answer them.

With the beginning of the third millennium, learning communities began to spread across the web. This was accompanied by the spread of a number of applications and software that meet the needs of these communities, which were called the second generation concept of the web ,such as blogs, media sharing services, and site feeds, which are services that gave the Internet a different character ;Internet users have become active and collaborative participants in building Internet content .With the widespread use of these services in the educational process, the concept of the second generation of e-learning emerged, which was characterized by the same interactive features as the second generation of the web .Thus, the nature of e-learning has fundamentally changed, which has made traditional learning theories such as behavioral, cognitive and even constructivism in a difficult position to explain non-traditional learning processes that rely primarily on second-generation e-learning services, despite the importance of these theories in understanding learner behavior in the social context. However, it appeared in an age and time when technology was not a major part of the learning process (Jassim and Marwa, 2019: 61).

Second: Education electronic

education electronic he is From latest and more Concepts educational widespread at our time This and took this is label from translation Word((E learningand letter (E)at The language English acronym for the word Electronic))means letter, which is Indicates to

me Use Hardware Such as computers and mobiles at education and word
)learning(which Means Learn (Mubarak, 2005: 121).

as such he is Submit content educational(electronic) via modes multi On computer and its
 networks to me learner easily for him Possibility Interaction active With This Content and
 with the teacher and with his peers whether It was that picture synchronized
 um asynchronous and so Possibility completion This learning at time and the place and at
 speed Which suits his circumstances and his capabilities (Al-Najdi, 2009: 111(.

Third: the concept the design educational

the design educational he is Building methodical for
 experiences learning using theories learning education, and he Represent overall
 process analyzing needs learning and its goals and development System receipt to
 meet That needs, It includes Development Material and education activities, and
 experience and evaluation all activities education and learning, as he is engineering the
 thing On according to simulation certain, or Process geometric for position What, given the
 fact that education he is intentional design for
 situations educational picture methodology organisation, in which driving to me learning, and
 learning he is change desired at Student behavior calendar Submit this
 is attitudes educational, require Process learning Design Material educational suits needs Stud
 ents and their abilities (Zayer, 2016: 76).

form general for design educational(ADDIE)for decision Across the internet:

make up This form:

➤ stage First: the analysis:

she Stone the foundation for all relay other to
 design course educational electronic, Include this is stage kit Tasks Related Of
 which: (what Objectives , ?what Theenvironment educational , ?from Category Targeted , ?w
 hat the needs own for students , ?how will be Specify needs)?
)Al-Mannai, 2002: 100(

➤ stage Second: the design

and care this is stage put charts and drafts primary for the course electronic, and
 eat Describe methods and procedures Which Related how Implementation of my
 operation education and learning (Sada, 2018: 376).

➤ stage Third: development

Complete at Stage Development Translation output Process the design From schemes and
 scenarios to me Material real educational, Are at this
 is stage composing Ingredients Situation or Content educational for the
 material educational and his production (Al-Etrebi, 2015: 610).

➤ Fourth stage: implementation(Application)

and done at this is stage Implementation
 of course educational On System Administration learning electronic From Yes The
 performance Actual By teaching and
 learning whether whether that at Class traditional school, Mother bylearning email, Mother F
 rom During software computer, um bags educational, Mother Others (Al-Khalifa, 2003: 10).

➤ **stage Fifth: the calendar**

at this is stage Complete making sure From Power course educational email, and measure Bezel Adequacy operations Education and learning and their efficacy, And the truth that Calendar Complete During all process stages Design course educational, Which During the researcher took Design Idea(ADDIE)to design course interactive, that for clarity its components and its details and comprehensive for all stages, And for the possibility of use it at attitudes educational what at that Courses e Interactive.

Fourth: Concepts

Concepts are the language and key to scientific knowledge ;Therefore, it is important in the educational process as it reduces the complexity of the environment ;Because it summarizes and classifies what is in the environment of things or situations, as it is the means by which you know and reduce the need for re-learning when facing any new, and thus help it to direct, predict and plan for any activity, as well as allow organization and link between groups and events (Abu Athra, 2012 : 30-31).

So concepts are the building block of knowledge, and their importance has increased nowadays more than ever, due to the explosion of knowledge and the expansion of its branches, due to the difficulty of being familiar with the aspects of any branch of it, so the teacher's concern has become to help students understand and be aware of the conceptual and logical structure of the material while leaving the details (Maree and Muhammad , 2009: 211).

Determining the components of the knowledge system occupies an important place in the educational system, and thus concepts constitute the broadest base in the knowledge system, as from the concepts are formed principles, laws and scientific theories, so providing the learners with them means that the learners will own a not easy part of the knowledge system(Al Maliki, 2003 : 38-40).

The second axis: previous studies:

First: A study (Abu Shqira, 2010)

(Designing an electronic learning environment to develop the skills of designing learning elements)

Second: Study (Abdul-Majid and Ibrahim, 2018)

(Designing an electronic learning environment based on the participatory web to develop the skills of designing and producing smart phone applications and confidence in digital learning among King Khalid University students)

Aspects of benefit from previous studies

1. Defining the research problem, highlighting its importance, and drawing its objectives accurately.
2. Choose an appropriate experimental design.

Chapter III Research Methodology and Procedures

First: Research Methodology:

Its main function is to use the experiment to observe the effects of the independent variable on the dependent variable and thus adjust the experiment procedures, with the absence of factors other than (the experimental variable) that affect the reality studied (Jawad and Mazen, 2014: 148).

Second: Experimental Design:

In order for the results to be correct, the experiment must be designed accurately and the variables must be controlled, otherwise the results will be inaccurate (Al-Shara et al., 2016: 130), and determining the type of experimental design depends on the nature of the problem and the conditions of the sample, so the researcher relied on the experimental design with partial control. For the two equivalent groups (control and experimental) with the post test of achievement and the technology awareness scale, as shown in Table (3).

Table (3): Experimental design of the research

final exam	dependent variable]*[independent variable	parity	the group	T
Chemical Concept Acquisition Test + Technology Awareness Scale	acquiring concepts + technology awareness	learning environment design	1. Chronological age in months. 2. last year's grades. 3. IQ test (Danleys.) 4. Technology Awareness Scale.	Experimental]*[1
		Ordinary		control]*[2

Third: The research community and its sample:

1. research community:

The research community is represented in the secondary and preparatory day schools for girls only in the province of Babylon / Kothi district for the academic year (2020 AD - 2021 AD), in which the number of divisions of the fifth biological scientific class is not less than two divisions, and for the purpose of determining the sample of the research from the original community that I identified the researcher to conduct her study on, she visited The researcher, the General Directorate of Education in Babil Governorate, according to the book issued by the University of Babylon / College of Basic Education / Graduate Studies (1/4/3/4/491) on (6/12/2020 AD) Appendix (3), for a list of names Preparatory and secondary schools for boys (morning), and their location in Babil Governorate / Kothi District, and table (4) shows this:

Table (4)Names of preparatory and secondary schools in Babil Governorate / Kothi district for girls only, and the numbers of their students and people for the fifth biological scientific grade according to the statistical manual for the academic year-20 (20AD - 20 21 AD)

Site	The number of people for	The number of students for	sex	School name	T
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	the fifth grade biological	the fifth grade biological			
Zubaidi	3	135	Daughters	Al-Nahrain Prep	1
Al Wahda District	2	81	Daughters	Al-Lawame' High School	2
Kothi Center	5	314	Daughters	kothy prep	3
message district	2	90	Daughters	Twentieth Revolution High School	4
Euphrates neighborhood	2	66	Daughters	Libra High Schools	5
Al-Rashid	6	314	Daughters	Al-Fajr High School	6
Liberty District	3	180	Daughters	Haidari high school	7
Kothi Center	4	41 1	Daughters	Umm al-Momineen Prep	8

2. The research sample:

Therefore, the current research sample is divided into two parts:

1. School sample:

After the researcher identified the eight schools included in the research, the researcher chose by the intentional way preparatory Umm al-Momineen located in the (Kuthi Center).

2. Female sample:

The researcher visited the preparatory school (Umm Al-Muminin for Girls) according to the book issued by the General Directorate of Education in the province of Babylon, the Department of Preparation and Training Appendix (4). The school administration showed great cooperation with the researcher, and the preparatory school included four divisions for the fourth scientific grade, namely: (A, B, C, d) with (34, 36, 35, 36) students in each class, respectively, and the researcher chose class (A) randomly]*[. To represent the experimental group that will study chemistry according to the electronic learning environment, and Division (C) to represent the control group that will study the same subject in the usual manner, and the total number of students in the two groups has reached (69) students.

Fourth: Equality of the two research groups:

The researcher conducted an equivalence between the two research groups in some variables that may affect the course of the experiment, despite the fact that the female students in the

same research sample are from social and economic milieu to a large extent similar, and they study in the same school, and of the same sex. These variables are:

1. Chronological age in months.
2. Chemistry test scores for the previous year (fourth grade science).
3. IQ test (Danleys).

Fifth: Controlling the extraneous (non-experimental) variables:

Although the researcher verified the equality of the two research groups in some variables that she believes affect the accuracy of the results, she tried to avoid the impact of some extraneous variables in the course of the experiment. Here are some of these variables and how to control them:

1. Selection of the sample members:
2. Associated accidents
3. Experimental extinction
4. Maturation-related processes
5. measuring tools
6. Experimental procedures

Sixth: Research requirements:

1. **Determining the scientific material :**The researcher determined the scientific material that will be taught to the students of the two research groups during the duration of the experiment. The scientific material included the three chapters of the Chemistry Book for the Fifth Grade Biological Sciences, 4th Edition, for the year (2019 AD) by its author: (Qasim Aziz Muhammad and others), and a table (11) This shows:

Table (11)Classes to be taught during the trial period

Chapter title	the classroom	T
The development of the atomic concept	the first	1
Bonding strength and geometric shapes of molecules	The second	2
solutions	the fourth	3

2. For ulating Behavioral Objectives:

After the researcher was briefed on the general objectives of teaching chemistry for the fifth grade bioscience set by the Ministry of Education, and the content of the study material, the researcher formulated three behavioral objectives for each chemical concept, and on three levels (definition, distinction, application) and since the number of concepts included in the experiment was (20) a concept, and the number of behavioral goals reached (60) goals, to verify the validity of these goals in terms of formulation and conformity with specific chemical concepts, as the researcher presented them in the form of a questionnaire that includes each concept and its corresponding goals to a group of experts in the specialty of methods of teaching science (Appendix) 8), and some modifications were made to it and it is ready as in Annex (9. (

3. Preparing teaching plans:

Since the preparation of teaching plans is one of the requirements for successful teaching, the researcher has prepared teaching plans for the subjects of chemistry that will be studied during the experiment, in the light of the content of the prescribed book and the formulated behavioral objectives, and according to the electronic environment for the students of the experimental group, and according to the usual method for the students of the control group, The researcher presented two model plans to a group of specialists in the field of education and its teaching methods, supervisors and teachers of chemistry Annex ,)8 (to explore their opinions, observations and suggestions for the purpose of improving the formulation of those plans, and making them sound to ensure the success of the experiment, and in light of what the arbitrators showed, some necessary amendments were made to them .Annex 10 is now ready for implementation.

Seventh :The search tool:

First: Preparing the Chemical Concepts Acquisition Test :The researcher followed several steps in preparing and applying the experiment.

- 1. Determining the objective of the test :**The designed test seeks to measure the acquisition of the chemical concepts included in the three chapters of the topics of the chemistry book, which are to be taught to them for the academic year (2020-2021 AD)
- 2. Determining the dimensions of the test :**The dimensions of the test were determined by following the processes of acquiring the concepts represented by (definition, distinction, application ;)It can be further explained as follows:
 - 1. Definition:** It means the meaning of the phrases that define all the distinctive characteristics of the concept in writing and verbally, which gives its name and asks it to mention it through what was previously presented.
 - 2. Discrimination:** It means the student's ability to collect multiple observations of some things and to distinguish between them, and through it he can distinguish between similar and different elements and things.
 - 3.Application :**It is the student's ability to use concepts to solve a problem, or to deal with new situations that he has not previously experienced, such as using maps and pictures of a general nature and by which he defines the concept (Saleem et al., 2006: 141 (
- 3. Drafting the test items :**In formulating the test items ,the researcher relied on a kind of objective tests, which is multiple choice.
- 4. Formulating the test instructions :**The researcher formulated the test instructions as follows:

The first: the instructions for answering :It included the objective of the test, the number of its paragraphs, how to answer supported by an illustrative example, the number of alternatives, and the time allotted for answering Annex (11.(

The second: Instructions for correcting the test :one point is assigned to the paragraph to which the student answers correctly, zero is given to the wrong answer, and the left-over paragraph or that has more than one answer is treated as the wrong paragraph.

- 5. Content validity :** To verify the validity of the content, the researcher presented the test items and behavioral objectives according to the levels of (definition,

discrimination, application) as well as the main and sub-concepts of the study subject included in the experiment on a group of arbitrators (Appendix 8), in order to indicate the extent to which the test matches the content of the subject. The study and its achievement, where the test obtained the approval of experts at a rate of (90%), and thus the researcher achieved the validity of the content of the test.

.1Apparent honesty :The researcher presented the test paragraphs to a group of experts in teaching methods and educational and psychological sciences (Appendix (8), to express their opinions and observations regarding their validity and the soundness of their formulation, and in light of them, the wording of some paragraphs and alternatives was modified and they obtained the approval of the experts with an agreement rate of (90%). and above, knowing that the calculated chi-square value ranged between ,) 29 (which is greater than the tabular chi-square value of ,) 3.84 (so all paragraphs were accepted .

6. Applying the test to the survey sample:

1. The first exploratory sample: The researcher used the following equation to extract the answer time:

)Average time = (for all students for total answers, total time) / (for total number of students
 Average time = $1286/30$ = approximately 43 minutes
) Al-Najjar, 2010: 36)

2. Second survey application:

The test was applied to a sample of (100) female students in the fifth bioscience class at (Kuthi Preparatory School for Girls) on Wednesday 17/2/2021 AD. The purpose of it is to statistically analyze the items of the achievement test, which are represented by the difficulty of the item, the item discrimination, the effectiveness of the wrong alternatives. .

.1Test stability :

The split-half method :The stability was reached using the Pearson correlation coefficient) 0.77 (and then corrected by the Spearman-Brown equation, it reached ,) 0.87 (and the test is considered stable, if its stability value is .)70(,)0or more (Allam, 543:2009).

Eighth: Test application : The chemical concepts acquisition test was applied to a second exploratory sample of fifth-grade biological science students at Kotha Preparatory School on Wednesday, corresponding to 17/2/)2020AD, as the students were informed of the date of applying the test a week before its application.

Ninth: Statistical Means

The researcher used the following statistical methods in the procedures of his research and analysis of his data:

1. T-test equation(t - test)for two independent samples
2. Chi-square (Ka^2)
3. Difficulty coefficient equation paragraphs
4. Paragraph discrimination coefficient equation
5. *Equation of the effectiveness of the wrong alternatives*
6. Alpha/Cronbach equation

)Al-Mousawi, 2015: 39(

the fourth chapter

Presentation and interpretation of results

First, display the results

To verify the validity of this hypothesis, the researcher calculated the arithmetic mean and the t-value using the t-test for two independent samples(t-test)to compare the average scores of the students of the two research groups in the chemical concepts acquisition test, and the result indicated that there are statistically significant differences between the average scores of the students of the two research groups (experimental and control), in the chemical concepts acquisition test, and this difference was in favor of the experimental group. The students of the experimental group who studied using an electronic learning environment design outperformed the students of the control group who studied in the usual way in the chemical concepts acquisition test, and the reason for this superiority over the regular group was that the students of the experimental group studied using the design of an electronic learning environment that used electronic technological means and techniques, which led to Developing the cognitive skills of the experimental group students in chemistry, and table (16) shows this:

Table) 16 (The results of the T-test for students of the two research groups in the test of acquisition of chemical concepts

Statistical significance	The two t values		degree of freedom	standard error	variance	standard deviation	SMA	Number of female students	the group
	tabular	calculated							
Statistically significant	2.000	4.085	62	1.03	33.29	5.77	47.77	31	Experimental
				1.20	47.88	6.92	41.24	33	control

Statement of the effect size of the independent variable on the dependent variable:

The researcher used Cohen's equation to extract the effect size (d)for the independent variable in the dependent variable, and the effect size was(d.)0.811()

1. Results related to the Chemical Concepts Acquisition Test:

1. The steps of designing and implementing the electronic environment helped the students to distinguish solutions and alternatives put in place and turn them into ideas, making their education easy.
2. The design of an electronic learning environment according to the associative theory aims to stimulate the students mentally, which leads to expanding the minds of the students with chemical concepts.

Third: Conclusions:

Teaching the biological sciences of fifth grade students according to the design of an electronic learning environment had a positive impact in raising their acquisition of electronic concepts.

Fourth: Recommendations:

at Light Results Which reach it This research recommends the following :

1. Establishing training courses and teaching programs for male and female chemistry teachers for the purpose of providing them with modern methods and methods and

how to design electronic learning environments and how to apply them to benefit from them in raising the level of their students.

2. Including the curricula of teaching methods in colleges of education and colleges of basic education in how to design electronic learning environments.

Fifth: Suggestions:

continuation For this search suggest researcher Do the following research:

1. Conducting a similar study using the design of an electronic learning environment in other variables(gender , electronic awareness, preventive awareness, blended thinking)
2. Conducting a study to evaluate the level of students' practice of technological awareness in the different educational stages.

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]*[**Dependent variable : the** variable that is predicted through our knowledge of its value as the independent variable , and the dependent variable in both groups is measured by the achievement test that is given to them after the end of the experiment and the technological awareness measure that is given to them before and after the end of the experiment.

]*[**Experimental group : the** group whose students are subject to the independent variable in teaching chemistry.

]*[**The control group : the** group whose students are subjected to the usual method of teaching chemistry.

]*[The researcher wrote the names of the people (A, B, C, D) on small papers and put them in a bag, and she pulled out the first paper, so the (A) division was to represent the experimental group, and the second paper was the (C) division to represent the control group.