Effectiveness of Designing an Electronic Course for the Subject of General Physics According to the Brain-based Learning Theory on the Achievement of Basic Education Colleges Students

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Article History: Received: 11 January 2021; Revised: 12 February 2021; Accepted: 27 March 2021; Published online: 4 June 2021

Abstract

Aim of the Study: Effectiveness of Designing an Electronic Course for the Subject of General Physics According to the Brain-based Learning Theory on the Achievement of Basic Education Colleges Students.

The researcher used the experimental method to examine its effectiveness after the end of the experiment on increasing students' achievement in general physics. The researcher adopted an experimental design of partial control with two equal groups: experimental and control. According to this design, a random research sample was selected from the research population representing students of the Faculties of Basic Education in Iraq - College of Basic Education, University of Babylon, Department of General Sciences- the first grade. The two group were equal in terms of the following variables: age (calculated in months), intelligence, and parents' achievement. The study subject included all the items of the general physics. The behavioral objectives of this course were drafted; they were as (110) objectives in number. To make a research tool, the researcher conducted an achievement test in general physics consisting of (50) objective multiple choice items of 4 alternatives. After applying the search tool and analyzing the results obtained statistically by the researcher using Microsoft Excel and SPSS software, the results showed that the students of the experimental group outperformed the students of the control group in the physical knowledge test.

Keywords: E-course, brain-based learning, achievement

Chapter One: Introduction

Problem of the Research

In light of latest developments throughout the world, the Arab student must ask himself/herself where his/her position is in the midst of these scientific and industrial revolutions! The Arab world is still using traditional teaching methods that do not keep up with modern life and modern way of thinking of a student and teacher should have in the age of rapid technological development.

Additionally, traditional education, nowadays, has not added much to the educational content of the coming generations because it, alone, cannot keep pace with modern way of thinking. Furthermore, the Arab world needs a quantity and quality shift for students of the 21th century since the education low is tremendously low compared to other international countries.

The challenges facing the world as a result of transformations in education, especially higher education, have imposed on society to create various ways of education far from the usual methods used in universities before. Higher education is facing many challenges, including the large numbers of students who are present at one time in a classroom, which is not often equipped with the necessary devices for active interactive learning. In addition, some basic devices for the learning process may not be available too. This may result in lack of communication and interaction between teacher and students, as well as lack in using any modern technological strategies because of lack of time (Ammar, 2012: 24).

Based on these reasons or justifications combined and due to the importance of using modern technology in education, the researcher sought to use modern models in teaching that help students to acquire systematic steps to reach the truth by observing, understanding and interpreting a specific problem in order to find appropriate solutions to it, whether this problem is one in life in general or in the different stages of education. Based on the fore-mentioned, the problem of the existing research can be expressed in the following question:

What is the effectiveness of designing an electronic course for general physics according to the theory of brain-based learning in the achievement of students of basic education faculties?

Research Importance

Many factors can influence person's life. An individual may consistently be subject to situations of interaction and change, and because he lives in a constantly changing world, education and higher education must adopt means to contain these changes. With knowledge accumulation, scientific and technical progress and rapid change, it is crucial for the individual to be acquainted with Information, knowledge and facts to face various situations and problems. This entails a flexible cognitive approach and an open mindset that seeks renewal progress. Among the means adopted by this approach are the creation of educational opportunities for individuals that help them carry out tasks and mental activities based on solving problems in different life situations (Al-Ghurairi, 2007: 25), and interaction with events they face to understand them. An individual builds on his or her knowledge to solve their problems independently based on their mental abilities and the knowledge acquired through their lives (Zaytoon, 2007: 23)

Recently, there has been great interest in brain studies by specialized scientists, but the last decade is considered the decade of brain. Researchers have had modern tools that enabled them to see the brain closely and photograph its states as it performs its functions during its development over time. They also monitor the effects of stimuli and food on children. Therefore, brain research sees clear results in its educational applications that have made changes in the teaching and learning processes. Among brilliant scholars worked on this were Ken and Ken, Jenson, Susa, and Baulph (Al-Rimawi, 2003: 133).

Main Pprinciples that have been drawn from brain research are:

Research conducted on human brain learning has found the following:

1. Simulation of the environment in terms of color and structure, known as teaching archi, where connections are formed in learners' brains.
2. Availability of safe places for learning, as well as places for learning in groups, and special places for facilitating social learning and simulating brain's social requirements.
3. Availability of clear signs in public places that refer to the population of the study and increase motivation, lending these places to be of personal nature.
4. Availability of active locations for the development of social intelligence and self-intelligence.
5. Changing and interacting with the environment, simulating the development of the brain and providing instructions for future developments in the environment, as well as enriching education, diversifying technology and distance learning. (Abu Riash, 2007: 151)

Research Aims

The following paper aims at understanding the effectiveness of designing an electronic course for the subject of general physics according to the brain-based learning theory on the achievement of students.

Research Hypothesis

To achieve the aim of the research, the following hypothesis can be stated:

- There is no significant difference at the 0.05 level between the average marks of the experimental group who study an electronic course of the general physics subject according to the theory of brain-based learning and the average marks of the control group students who study the same subject in the usual way in the achievement test.

Research Limits

1. Spatial limit: Babylon University- Basic Education College
2. Time limit: Academic year 2020-2021
3. Subject limit: General Physics Subject
4. Human limits: First stage students of the General Physics Department

Defining of Terms

First: *Effectiveness* - it is the achievement of a goal and the ability to achieve; it is the measure by which we recognize performance of the teacher and performance of the learner and their roles in the learning and teaching process. (Atiya, 2008: 61)

Second: *Brain-based Learning*- It is a theory of learning that emphasizes learning with the presence of mind, the availability of high excitement, realism, fun, suspense, cooperation, and the absence of threat. These systems overlap with in educational process (Jensen, 32, 2000).

Third: *Achievement*- The extent to which the student acquires educational facts, concepts, principles and theories in a school stage or in a particular class or course and the extent to which he is able to do so (Al-Salakhi, 26: 2013)

Fourth: Operational definition- The outcome of what the third-stage students have learned in the College of Basic Education - University of Babylon in the subject of the General Teaching Methods, after the elapse of a period of

specific experience. It can be measured by the marks obtained by students in the achievement test (objective) on the General Teaching Methods, which is (50) items, prepared by the researcher for research purposes.

CHAPTER TWO

Literature Review and Previous Studies

Topic One: E-course

The curricula are considered one of the main pillars a method. They should be organized according to educational basis and standards, foremost of which are that these curricula are closely related to the students' lives, their levels and their growth requirements, the society and its needs, knowledge and its developments. At the same time, the method identifies the outlines and implications of academic courses and draws the general methods and means that help the teacher and student in dealing with the study of literary, scientific, cultural and artistic subjects, contributing to achieving the general and specific objectives of those courses, and evaluating the process of their teaching.

Therefore, we can say that the dialectical (reciprocal) relationship between the syllabus and its contents and directions, on one side, and what translates these contents and directions, i.e. the curricula that are built and designed according to what the curriculum refers to as topics that include the educational material, and the various activities undertaken by the student inside and outside a classroom that contribute to achieving the educational goals set by the curriculum and to determine the extent and degree of their achievement. (Rafa Al-Sayyid, 100:2006)

Characteristics:

A- Easy to navigate its content, as the software contains graphical tools that help the student to move among its contents.

B - Achieving a better presentation of the educational material through the support of the multimedia patterns used within the software, which is not available in the traditional method of teaching through the textbook. (Rima Al-Jarf, 2004: 258)

C- Provides different modes of interaction with the content in order to improve the student's continuous assessment process according to the development of his achievement level.

D- Availability of the study material that enables the student to control the presented program in terms of content and response time, and to choose assistive methods or training patterns available in programming. (FAO, 351: 2000)

The second Topic: brain-based learning:

- Importance of brain-based learning

The importance of brain-based learning lies in the fact that it has an impact on all elements of the educational learning process through the following:

1. Curriculum: Curricula must be designed to suit the learning process and the learner's interests and to make the learning process valuable.
2. Teaching: The teacher allows learners to learn by taking into account the differences between them. Teachers build knowledge on solving real problems, as well as encouraging learners to learn through sessions outside the classroom and the school.
3. Assessment: Since all learners are learning, their assessment processes should allow them to understand their learning patterns and desires and in this way they can review and reinforce their learning process. (Khitabiya, 2008: 112)
4. Educational Environment

The educational environment should be exciting and rich in color and teaching design and provide places for group learning to facilitate social learning. It should also stimulate the social brain, provide psychological security, reduce threat, use diverse teaching strategies to attract learners' interests, and give students the opportunity to express their various and diverse desires and use the different senses (Al-Khaffaf, 2014: 316-317).

Features of Brain-based Learning:

A - The environment is a main source in developing mental abilities and increasing brain capacity. The brain is affected by environmental and practical experiences, resulting in increased learner's abilities to deal with things in a better way.

B - Brain-based learning confirms that intelligence is dynamic rather than a fixed process. It is affected by environmental factors, and the learner grows and gains multiple properties and characteristics. Therefore, the theory of brain-based learning agrees with Gardner's theory of multiple intelligences since brain cells are affected by the environment surrounding the learner. These cells grow from time to time according to the information coming from the senses. So, a human brain is flexible and can acquire new abilities that help in refining and strengthening many of the intelligences in different ways.

C- Brain-based learning is affected by the learner's developmental stages. Abilities grow and develop rapidly in childhood and adolescence, stages that are important in building and refining the learner's abilities, especially in learning language, imitating sounds, pronouncing words, acquiring motor skills, developing emotional aspects, and understanding the surrounding environmental changes. (Afaneh and Naila, 2007: 112-113)

14-2- Benefits of Brain-based Learning Theory

Caine & Caine 2002 summarized the benefits of using brain-based learning theory in the educational process as follows:

1. It enables learners to solve problems in different ways and works on developing dialogue and discussion in the classroom.
2. It motivates the learner to take part in the decision-making process.
3. It directs the learning process towards understanding and it contributes to the development of learners' experiences.
4. This theory enables learners to deal with more than one job at the same time due to the dynamic ability of the brain. (Nawfal, 2010: 67).

Topic Three: Achievement

Academic achievement is one of the concepts which are commonly used in the field of education, and educational psychology in particular because it is importance in evaluating student's academic performance. It is deemed a touchstone in determining the student's academic level and judging the size of educational production, both quantitatively and qualitatively (Al-Jalali, 2011: 22). Many specialized scholars have discussed the concept of academic achievement in various ways, but maybe the most prominent trends in defining this concept is in linking it to the concept of school education. There are a number of definitions presented in this direction, including the definition of (Ismaili, 2011), where he defines achievement as the degree of acquisition that an individual achieves; or the level of success that he achieves or reaches in a particular subject or field of education or training. The tests that the teacher applies to his students throughout the academic year, such as tests of biology, chemistry, or physics are supposed to measure the academic achievement (Ismaili, 2011: 59).

Academic achievement plays a major role in defining the learning process. It is considered the first and basic area of learner assessment. The achievement in its modern sense represents the acquisition of correct scientific methods through which school skills can be accessed in an organized scientific way. It focuses on two basic aspects: knowledge and skills. This interest in knowledge and skills means implicitly paying attention to the emotional aspect.

Undoubtedly, the process of knowledge acquisition is not a purely mechanical process; rather, it is one of the mental arts, which has its origins, rules and methods. The knowledge acquisition is based on a closer look, awareness, perception, comprehension, analysis, sythesis, comparison, application, generalization, distinction and linking between materials together and with the walks of life. Academic achievement is the final result that shows the student's level and degree of progress in learning what he is expected to learn (Al-Salkhi, 2013: 113) (Al-Asadi, 2015: 181)

Topic four: Previous Studies

Comparison Table

a- Studies deal with integration between the constructivism and brain-based learning theories (Al-Ghamidi, 2016) (Effectiveness of a proposed model for teaching science according to the brain-based learning in achievement, development of brain habits, and metacognitive skills of the sixth primary class. Unpublished PhD thesis, College of Education, King Khalid University, Abha.)

Study aim	Study venue	No. of sample	Study tool	Method	Statistics means	Results
Identify effectiveness of a proposed model to teach science based on brain-based learning in achievement,	Saudi Arabia	The sample consist of 58 students of primary sixth class students in the educational yard area	Achievement test, habits of brain measure, metacognitive skills test.	Combined the analytical descriptive approach with regard to the developing of tools of the study	Statistical process of data was conducted by using a set of statistical program for social sciences to test the validity of study hypothesis. Hence, the SPSS was used as follows: Descriptive statistics (percentage, median, standard deviation)	Prominent among results are: there are differences which statistically significant at the level 0.05 among those with average marks in the post-test achievement, brain habits

and developing brain habits and meta cognitive knowledge of primary sixth class students			and result analysis, and the experimental approach	Constancy coefficient was found by using spearman-Brown split reliability Wilcoxin biometrical test for two samples associated with testing the hypothesis no. 3 and 4. Size of effect to ensure that the differences have an effect and they are not coincidental.	measures, metacognitive skills for the experimental group. Resullts also showed effectiveness of the proposed model for learning, based on integration in constructivism and brain-based learning on achievement, development of mind habits, metacognitive skills of primary sixth class.

b- Studies dealt with the achievement

Study of Ghani (2020)- Designing an interactive course in the subject of Educational Technique in the achievement of Basic Education colleges students

Study aim	**Study venue**	**No. of sample**	**Study tool**	**Met hod**	**Statistics means**	**Results**
The study aims at identifying an interactive course for the subject of Educational techniques on achievement of Basic Education colleges students	I raq	The sample consists of 63 male and female students of Basic Education colleges students- Babylon University distributed in two groups: experimental and control	The tool is represented by the achievement test	The semi-experimental approach is used	The researcher used the T Test for the two independent samples, Chi equation, and item difficulty coefficient, Pearson Correlation Coefficient, difficulty coefficient equation, equation of the effectiveness of the wrong, and alpha equation	Among the results reached is that the improvement in the achievement level of the experimental group is higher than that of the control group

Chapter three: Research Methodology and Procedures

First: Research Method

The experimental method is used for its suitability to conduct the research.

❖ **Experimental Design**

The researcher relied on the experimental design of two equal groups (an experimental group, which is based on the interactive course; and a control group based on the normal method) of the post-test for achievement test. The following table shows the experimental design of the study.

Group	التكافؤ	Independent variable	Subordinate variable	Test
experimental	1. Chronological age (in months) 2. Intelligence 3. parents education	Interactive course according to brain-based learning	achievement	Achievement test
Control		Normal method		

1) Population and Sample of the Study

All students of (10) Basic Education colleges throughout Iraq. Population of the study is 5662 students for the academic year 2019-2020.

Table (2) No. of sample individuals for the experimental and control groups

Group	Sample of study
Experimental	35
Control	35
Total	80

2) Control Measures

A. Internal safety of the experimental design: it is represented by the following:

❖ Research groups equivalence

The experimental and control groups are equal in 3 variables: chronological age (in months), intelligence, and parents education.

B. External safety of the experimental design: it was verified by controlling a set of factors including:

1. Experimental depreciation; 2. Maturity; 3. Measuring tool; 4. Selection sample individuals; and experimental measures.

Second: Research Requirements

1. Identifying the subject matter

The researcher identified the subject matter that would be taught to the research groups (experimental and control) in accordance with the general physics items developed by a panel of the Ministry of Higher Education and Scientific Research.

2. Drafting of behavioral objectives

The researcher drafted the behavioral objectives and distributed at six levels: remembering, comprehension, application, analysis, synthesis, and evaluation, according to Bloom's Taxonomy. The total behavioral objectives for the general physics were 110 objectives.

3. Development of Teaching plans

Teaching plans are "a set of organizational measures" prepared by the teacher and adopts them to ensure success of the teaching process and achieve the desired educational goals. This plan is flexible and can be modified and changed" (Salama et al., 2005: 95).

4. Teaching aids

The teacher should use proper teaching aids for the educational situation and for the students. The researcher used videos, pictures, drawings and diagrams as teaching tools in the interactive course. The iPad, which is one of the main tools for teaching, was also used.

Seventh: Research Tool

This research requires preparation of an achievement test, which was prepared by the researcher according to the following steps:

A - Building the test items:

After reviewing previous studies and educational literature, (50) items were developed.

b- Test instructions:

Specific instructions were developed for students to answer the test items and explain how the students should provide accurate answers.

C – Typical answers
Typical answer to the test items were developed.
e- Test Validity
* Face validity:
The researcher presented the physical knowledge test in its initial form to a group of arbitrators specialized in education and its teaching methods. She obtained a fairness rate of (100%).

***Application of the test on the initial survey sample**

Logical thinking skills test was applied to a surveyed sample of the 50 students of the first stage of the Science Department, Al-Mustansiriya University, to ensure clarity of the items, test instructions and their diagnosis of the items.

***Application of the second survey sample:**

After ensuring the clarity of the test items and determining the time required for the test, the test was applied to a second surveyed sample consisting of (100) male and female students in the Department of Science at the University of Maysan to conduct statistical analysis and finding the rate of difficulty and the coefficient of excellence.
* Test reliability: it was conducted through the split-half method and the Kewder equation for reliability.
* Application of the achievement test:
After finishing the course, students of the experimental group, the researcher applied the achievement test on the two research groups at the same time.
Third: Statistical Tools
The researcher used the SPSS application and Microsoft Excel in processing the data.

CHAPTER FOUR

Results and Analysis

First: Presentation of Results

For the purpose of verifying the null hypothesis, which states that "There is no statistically significant difference at the (0.05) level between the average marks of the experimental group students who studied according to the brain-based learning theory and the average marks of the control group students who studied according to the normal method."

The researcher used the T-test for two independent samples to show the differences between the mean marks of the experimental and control groups in the achievement test. Table (2) illustrates this.

Table (2) T. test results of two independent samples for the research groups in the achievement test

Group	Sample no.	median	Standard deviation	Degree of freedom	T value		cance at level (0,05)
					calculated	Table	
Experimental	35	35.69	6.543	68	2.8	2 ,000	function
Control	35	31.69	5.086				

Table (2) shows that the arithmetic mean value of students marks of the experimental group was (35.69) with a standard deviation of (6.543), while the arithmetic mean of the scores of the students of the control group was (31.69) with a standard deviation of (5.08) for the experimental group and (5.09) for the control group, and the calculated T-value was (2.8), which is greater than the tabular T-value of (2,000) at a degree of freedom of (68) and a significance of (0.05). This indicates that there is a statistically significant difference in favor of the experimental group in the achievement test; thus, the first null hypothesis is rejected and the alternative hypothesis is accepted in favor of the experimental group.

Second: Discussion and result analysis

Results related to the null hypothesis show that the students of the experimental group, who studied according to an electronic course that is based on the theory of brain-based learning outperformed the students of the control group, who studied according to the normal method. Results can be interpreted as follows:

1. The educational material is presented in a sequential and coherent manner, which increases the learner's efficiency, and stimulates their mental abilities to search for information and discover the relationships between them and link them to their needs and previous knowledge. This will encourage the learner to think about what he is learning, and strive to organize it and link it to the new knowledge to take it and retrieve it, If necessary.

2. Providing activities and engaging students in those activities that will lead to the strengthening and implementing of the material and using them in new educational situations. Additionally, immediate feedback and informing students of correct answers will contribute to increasing the effectiveness of learning and raising the efficiency of students in the experimental group.

Third: Conclusions

Based on the research results, the following conclusions were reached:

1- Using an electronic course requires less time and effort from the teacher than the those expended in the normal way.

2- Using the theory of brain-based learning in teaching activates previous knowledge and generates excitement, motivation and suspense for the lesson, which increases students' academic achievement.

Fourth: Recommendations

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

1- Educating academics on the importance of learning theories and their role in achieving effective learning.

2- The significance of preparing courses based on integration of the two theories since they have a role in stimulating students' brains and building their knowledge.

3- Adopting the achievement test prepared for this study in further educational research.

Fifth: Suggestions

To complete the research topic, the researcher suggests the following:

1- Conducting a study similar to the current study on scientific subjects (chemistry and biology).

2- Making use of the course prepared in this study to teach students.

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