

A GAME-BASED EMPIRICAL FRAMEWORK FOR EFFECTIVE TEACHING PEDAGOGY OF PRIMARY SCHOOLS' STUDENTS

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ABSTRACT

This research aimed to investigate the effectiveness of using electronic educational games on direct achievement of fifth grade students in mathematics' regular fractions (remembering, understanding andractinging) skills. For some mathematical concepts of the fifth grade of primary school compared to the traditional method. The research

sample consisted of (30) students as an experimental group and (30) students as a control group. The experimental group studied using electronic educational games, while the control group studied the units same as in the traditional way. A pre-exam was conducted to measure the achievement of the two groups before conducting the study, and there was no differences between them. An achievement test had been developed in the same units of mathematics to measure direct assessment. The results indicated that there were statistically significant differences in direct achievement, attributable to the method of teaching, and in favor of Experimental group. The research recommends using electronic educational games in teaching mathematics at the basic education stage

Index Terms— Control group, Experimental group, Electronic educational games, Pre-test, Post-test, Students' Direct Achievement, T-test.

I. INTRODUCTION

The last decades of this century witnessed many successive developments in scientific research, technological and educational fields, and this development shows impact on various

educational fields, as the bright face of technology would show its fruits in the education process if it is used in the correct manner that meets the needs, capabilities and requirements of students and also suits with the experiences of teachers and with the educational environment. The more development of technologies the easier learning for the students as we can see in our daily life the majority of children using their tablets or any electronic devices to solve puzzles or play games to reach the target and score points so in this research we are trying to convey this technology to make the students learn to do mathematical operations based on the technology of games, it is an easy way to make them understand mathematics fractions and get used to it by easy way that is why we had seen a great impact of students' performance after learning the technique by playing electronic game.

Education was developed in several stages, the first of which was before 1983, where education was using traditional methods, in that stage communication between teachers and students in the classroom was according to specific criteria. The second stage was between 1984 and 1993, the use of multimedia through operating systems and CDs began Which was the main tools for the development of education, and then the third stage started until the year 2000 when the global information network (the Internet) appeared widely, and since 2001 the second generation of the global information network appeared, as the design of websites on it became more advanced, electronic educational games is one of the methods of education in delivering information to the learner, in which modern communication mechanisms are used; From a computer, networks, multimedia, search mechanisms, electronic libraries, as well as Internet portals, whether in the classroom, during or outside the teacher's working hours, to achieve the main objective of using these technologies in education, which is to deliver information to the learner in the shortest time, least effort and greatest benefit.^[1]

The information revolution and globalization have also provided modern methods of teaching, discussion and communication instead of traditional methods based on indoctrination, memorization, pressure and stifling students' talents, by providing teaching methods that take into account talents and abilities, achieve flexibility in performance development and achieve individual learning.^[2]

In this era, children of today's are growing and they have to deal with a huge amount of information and are exposed to complex daily problems through what technology provides them with unprecedented thinking tools that provide them with strong opportunities to learn and understand the concepts of their age by experimenting with technology and using it in the

learning process. It is known to us that teachers are always looking for ways to help them perform their educational functions in order to access to better education, and some of them use the means of technology, including the computer and the Internet. The computer provides an interactive learning environment, and the Internet helps to deliver knowledge as quickly and easily as possible, enabling learners to deal effectively with information. Rather, the matter extended to entertaining and exciting electronic games that provoke Children's Attention.^[3]

It is known that play is an innate tendency that exists in most of the individuals, especially the early stages of life, and is considered an important educational mediator that contributes tremendously to the formation of the child's personality as it gives him the opportunity to use his mind and increase his ability to understand with the presence of the factor of suspense and attraction to the child's attention, and he can learn the concepts of counting, arithmetic operations, weight, size and belonging recognize shapes, knows the concepts of right and wrong, and a lot of other things.

Principles and concepts, as the child can express himself and his needs that he cannot express in reality through play.

Some games are free and are under the supervision of the teacher and without guidance from him, and some are directed to be played by him. The student is under the supervision and direction of the teacher; these games often follow organized steps and rules.^[4]

Mathematics is one of the most important subjects, and perhaps the most difficult of all other subjects, due to their educational nature, are focused on them on numbers and abstracts. It becomes more acceptable to learners, especially at the stage of learning Elementary if it depends on tangible things by which the learner can perceive the truth Mathematical knowledge and uses it in his daily life.^[5]

The subject of regular fractions is one of the most difficult topics that students face in mathematics because of the change in the method of arithmetic.

Stresses play a vital role in educational performance while raising children in their first levels, because of the importance, capabilities and characteristics of this period, it is required to shape the child at this crucial formative stage of his development.^[6]

Play is the life of a child that makes him feel happy, and tends to create a world of illusion and

imagination. In it, he exercises his pleasurable and confident experiences, without fear of interference others. As stated in psychoanalytic theory, play can be a starting point for exploration and treatment for mental illness, it is a process of pastime and entertainment to help relieve Tension and agitation.^[7]

Educational games are among the modern means and methods used in teaching subjects as different as mathematics, sciences, social sciences...etc.^[8]

Due to the many benefits achieved from its use, especially as we live at the beginning of the century.

The twenty-first century, in light of the explosion of the technological revolution in various areas of life, and this calls for To the need to work on preparing our children to live with the data of this century.^[9]

By increasing their acquisition of knowledge and experience in various educational subjects, especially mathematics, given its importance and its many uses in different areas of life.^[10]

This course (Normal Fractions) includes the following subjects: 1-Review Fraction, 2- Compare and order fractions, 3- (Add, Sub, Multiply, Dividing) fractions.^[11]

Procedural definitions

Electronic educational games: It is a computer program designed and programmed by the researcher. It was programmed in Visual Basic and Camtasia for making videos, well prepared.

To teach the concepts of multiplication, division and fractions from the mathematics book for the fifth grade in Yemen, where the student was the main element participating in these games.

Direct achievement: It is the result of what students learn after completing the study of the subject directly, and it is measured by the total marks obtained by the student in the test which was prepared for this purpose.

The educational material has a period of up to three weeks, measured by the sum of the marks that were given.

The student obtained it in the first test itself.

Mathematical concepts: a set of concepts of multiplication, division and fractions that students learn From the mathematics book for the fifth grade in Yemen.

The traditional method: It is the method that presents the educational material in the usual ways.

Using the usual teaching aids, such as the board, chalk, paper and pen, and the basic role for the teacher.

The Research Hypothesis

1. There are significant differences at level of α (0.05) between the mean scores of the direct achievement of experimental group and control in Remembering skills.
2. There are significant differences at level of α (0.05) between the mean scores of the direct achievement of experimental group and control in Understanding skills.
3. There are significant differences at level of α (0.05) between the mean scores of the direct achievement of experimental group and control in Application skills.

The Research Methodology

The research was carried out using the experimental methodology in which the 30 student were treated as an experimental group and 30 students as control groups. This experimental group had studied the course of fraction instrumentation being programmed using electronic educational games, the control group had studied the course of fraction by traditional way.

Experimental Design

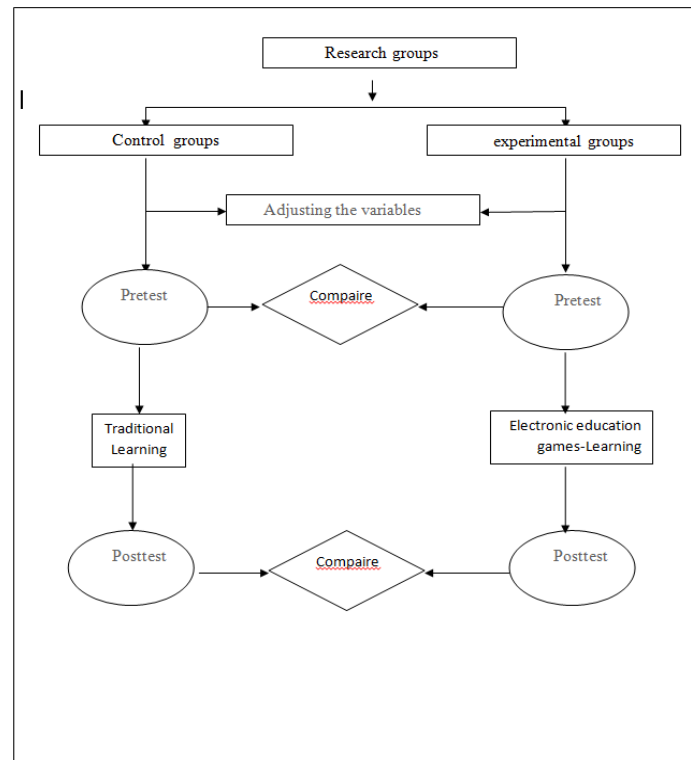


Fig. 1: Experimental design research.

A. Variables Calculations and Statistical Processing Research Importance

After completing the experiment, I have collected the data to be analyzed used SPSS -18 , program , two independent groups .The following relations were used in this research to measure the students' gain in achievement after studying fraction course using the electronic educational games approach and student studying by traditional way , to compare between them,

1-Effect Size: How much change the independent variable will affect the students' direct achievement. In this research I mean how much change the electronic educational games approach will affect the fraction students' direct achievement. Statistically, t-value with degrees of freedom df.

2-Descriptive statistics.

3-t-test: The t-distribution is a bell-shaped, symmetric about the mean distribution, used when the sample size equal or less than 30 and the variance is normally or approximately normally distributed. It is actually a family of curves based on the concept of degrees of freedom, which is related to sample size ($df = n-1$). As the sample size increases, the t- distribution approaches the standard normal distribution.

RESULTS

B. Two independent samples statistics of pretest

1: Remembering

To ensure that the two groups of the study were, the arithmetic means and deviations were calculated. The standardized marks of the study sample students on the pretest test, according to the different levels of the study variable: the method, and tables (2). It is clear from this table and table (1) that the mean is (3.0667) and (3.2333). The computer t value equal (-0.504) at the degree of freedom equal (58) with statistical significant (0.616). This is greater than the claimed level of significance α (0.05), therefore the two groups are equivalent in Achievement (Remembering).

Table 1: Descriptive Statistics for Achievement (Remembering), pretest.

Test	N	Mean	Std. deviation
Experimental	30	3.0667	1.38796
Control	30	3.2333	1.16511

Table 2: Achievement (Remembering) independent two samples t-test, pretest.

Achievement	T-value	df	P-value
Experimental	-0.504	58	0.616
Control			

C. Two independent samples statistics of pretest

2: Understanding

To ensure that the two groups of the study were equal, the arithmetic means and deviations were calculated. The standardized marks of the study sample students on the pretest test, according to the different levels of the study variable: the method, and tables (4). It is clear from this table and table (3) that the mean is, is (3.2667) and (3.8000). The computer t value equal (-1.730) at the degree of freedom equal (58) with statistical significant (0.089). This is greater than the claimed level of significance α (0.05), therefore the two groups are equivalent.

Table 3: Descriptive Statistics for Achievement (Understanding), pretest.

Test	N	Mean	Std. deviation
Experimental	30	3.2667	0.98027
Control	30	3.8000	1.37465

Table 4: Achievement (Understanding) independent two samples t-test, pretest.

Achievement	T-value	df	P-value
Experimental	-1.730	58	0.089

Control			
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D. Two independent samples statistics of pretest

3: Application

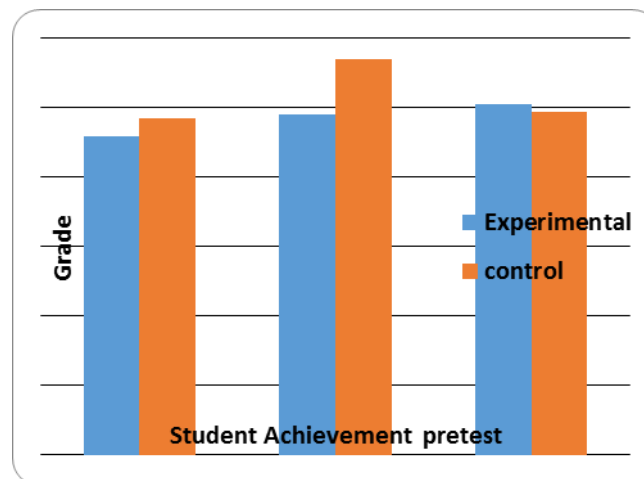
To ensure that the two groups of the study were equal, the arithmetic means and deviations were calculated. The standardized marks of the study sample students on the pretest test, according to the different levels of the study variable: the method, and tables (6). It is clear from this table and table (5) that the mean is (3.3667) and (3.3000). The computer t value equal (0.177) at the degree of freedom equal (58) with statistical significant (0.860). This is greater than the claimed level of significance α (0.05), therefore the two groups are.

Table 5: Descriptive Statistics for Achievement (Application), pretest.

Test	N	Mean	Std. deviation
Experimental	30	3.3667	1.58623
Control	30	3.3000	1.31700

Table 6: Achievement (Application) independent two samples t-test, pretest.

Achievement	T-value	df	P-value
Experimental	0.177	58	0.860
Control			



E. Two independent samples statistics of posttest

1: Remembering

With regard to the first hypothesis: a statistically significant difference was found at the level of α (0.05) between the mean of the direct test due to treatment (teaching method) in favor of the experimental group, from table (8) and table (7) its mean was (5.2667) compared to in the

control group, whose mean was (4.2667) The computer t value equal (3.015) at the degree of freedom equal (57.899) with statistical significant (0.004). this is less than the claimed level of significance α (0.05), the collection Direct mathematical concepts by the students of the experimental group and who learned Using computerized educational games was better than the students of the control group .And those who learned the same subject in the traditional way, which means Accept the hypothesis

Table 7: Descriptive Statistics for Achievement (Remembering), posttest.

Test	N	Mean	Std. deviation
Experimental	30	5.2667	1.58623
Control	30	4.2667	1.31700

Table 8: Achievement (Remembering) independent two samples t-test, posttest.

Achievement	T-value	df	P-value
Experimental	3.015	57.899	0.004
Control			

F. Two independent samples statistics of posttest

2: Understanding

With regard to the second hypothesis: a statistically significant difference was found at the level of α (0.05) between the mean of the direct test due to treatment (teaching method In favor of the experimental group, from table(10) and table (9) its mean was (6.9000) compared to In the control group, whose mean was (5.3667) The computer t value equal (4.319) at the degree of freedom equal (55.293) with statistical significant (0.00). this is less than the claimed level of significance α (0.05), the collection Direct mathematical concepts by the students of the experimental group and who learned Using computerized educational games was better than the students of the control group .And those who learned the same subject in the traditional way, which means Accept the hypothesis .

Table 9: Descriptive Statistics for Achievement (Understanding), posttest.

Test	N	Mean	Std. deviation
Experimental	30	6.9000	1.21343
Control	30	5.3667	1.51960

Table 10: Achievement (Understanding) independent two samples t-test, posttest.

Achievement	T-value	df	P-value
Experimental	4.319	55.293	0.000
Control			

G. Two independent samples statistics of posttest 3: Application

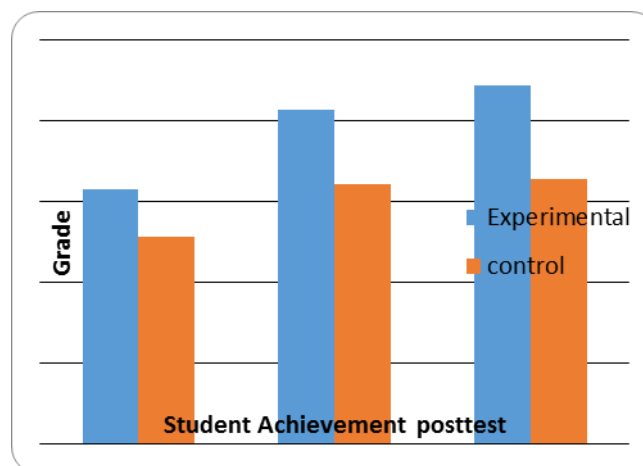
With regard to the third hypothesis: a statistically significant difference was found at the level of α (0.05) between the mean of the direct test due to treatment (teaching method In favor of the experimental group, from table(12) and table (11) its mean was (7.4000) compared to In the control group, whose mean was (5.4667) The computer t value equal (4.709) at the degree of freedom equal (57.295) with statistical significant (0.00). this is less than the claimed level of significance α (0.05), the collection Direct mathematical concepts by the students of the experimental group and who learned Using computerized educational games was better than the students of the control group .And those who learned the same subject in the traditional way, which means Accept the hypothesis

Table 11: Descriptive Statistics for Achievement (Application), posttest.

Test	N	Mean	Std. deviation
Experimental	30	7.4000	1.49943
Control	30	5.4667	1.67607

Table 12: Achievement (Application) independent two samples t-test, posttest.

Achievement	T-value	df	P-value
Experimental	4.709	57.295	0.000
Control			



CONCLUSIONS

The goal of any learning activity is for learning to take place. A common way to measure the effectiveness of instruction is to measure learner achievement. Measuring learner achievement in electronic educational games environments requires special attention. In fact, traditional methods for measuring learner achievement can be applied to electronic educational games courses with some forethought and modification. Quizzes, exams, team and individual

projects, as well as written assignments, can all be used in electronic educational games courses. The use of electronic mediums can even make grading of tests and quizzes easier because scores can be tabulated immediately following the completion of a quiz or test, providing quick and accurate feedback to learners. When examining the descriptive data concerning the achievement pretest and posttest scores for experimental and control groups, it was found that there is an increase in the mean of experimental after the application of the electronic educational games of the course. Also, the standard deviation in the post test of experimental group is reduced compared to the standard deviation in the post test of control group which means less data variations and pointed out that the student's scores are around the mean. Therefore the hypothesis stated that (There are significant differences at level of α (0.05) between the mean scores of the achievement of posttest for experimental and control groups) was Accepted.

From this discussion, it is clear that electronic educational games approach has good efficiency in learning and improves the students' direct achievement and attitudes toward this new systematic way of learning using the new technology based on computer and multimedia tools. After the results of the research have been lighted, the researcher would like to suggest the following points:

- Inviting teachers and parents who find their child weak in one of the mathematics subjects or For fear of it, he sees him using an educational electronic game that improves his level of study and helps him To link mathematical concepts and learn operations in a fun and entertaining way.
- Encouraging teachers to employ electronic games in teaching mathematics, and to take advantage of websites Electronic games that contain games suitable for the subjects they are studying.
- Working to link school curricula with electronic games, especially in the early school stages.
- Paying attention to the issue of mathematics anxiety and striving to reduce its level among students by various means and methods Teaching, especially electronic games.
- Urging researchers to do more studies that are concerned with the effectiveness of electronic games in teaching Maths.

REFERENCES

1. Al-Nawaisah, Adeb Abdullah Educational Uses of Educational Technology, 1st Edition,

- Amman: House of Treasures of Scientific Knowledge, 2007.
2. Clinics, Youssef Ahmed The educational computer and its educational applications, 2nd edition, Amman: Dar Al Masirah for Publishing and Distribution, 2014.
 3. Al-Shahreri, Maha Hosni Electronic games in the era of globalization (what they have and what they have), i 1, Amman: Dar Al Masirah for Publishing and Distribution, 2008.
 4. Abdel Hamid, Awatef Hassan Production of Educational Aids, 1st Edition, Kafr El-Sheikh: House of Science and Faith, 2010.
 5. Abu Zina, Farid, Ababneh, Abdullah Teaching Mathematics for Beginners – Riyadh Children and the lower primary stage, Al Ain: Al Falah Library for Publishing and Distribution.
 6. Melhem, Sami. The use of play in teaching scientific concepts and information in Mathematics for the fifth grade of primary school. King Saud's university magazine. Sciences Educational and Islamic Studies, 2002; (14): 768-731.
 7. Anani, Hanan. Play in children, theoretical foundations and application. Amman: Dar Al-Fikr for Printing and Publishing, 2002.
 8. Leonard, L.M. & Tracy, D. M. Using games to meet the standards for middle school students. Arithmetic Teacher, 1993; 40(3): 499-501.
 9. Oldfield, B. J. Game in the learning. Mathematics in School, 1991; 20(3): 16-18.
 10. Najm, Thursday. The effect of using educational sports games on classroom students The seventh primary on each of their acquisition in mathematics and their attitudes towards it. Message Unpublished MA. University of Jordan. Amman, 2001.
 11. Ministry of Education in yemen Math for level 5 second semester, normal fraction, 2008; 1-45.