THE EFFECTIVENESS OF USING E- GAMES ON ACADEMIC ACHIEVMENT AND LEARNING OUTCOMES ACORDING TO SOLO ASSESSMENT

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ABSTRACT

This research aims to study the effectiveness of using E-games on learning outcomes for the fourth grade students , the learning outcomes was assessed using (SOLO) taxonomy which divide the students learning outcomes into three levels that makes the assessment process easier to observe . The research used the E-games which is available on some sites such as: a) http://lightupyourbrain.com/,b)https//play.google.come/store/apps/details?id= com.gameimax.learningsciencekidsschool, c) http://www.multiplication.com /games/all-games

The sample of the research was chosen from the fourth grade primary school- (36) students - who are studying at fifth and eleventh primary schools (at Afif province), furthermore the research followed the experimental method of the two groups (controlled and experimental). The research applied an observation questionnaire sheet prepared by the researchers and an academic overall test, the observation process toke time during the second semester of the academic year 2016-2017. In addition, the research came up with the following results: a) There are statistical significant differences between the results of both the experimental group which studied using the e-games and the controlled group which studied in the traditional way in the academic achievement for the experimental group, b) There are statistical significant differences between the results of both the experimental group which studied using the e-games and the controlled group which studied in the traditional way in the learning outcomes for the experimental group.

Keywords: effectiveness, E-games, learning outcomes, SOLO, and fourth grade students

INTRODUCTION

Games are generally considered as a source of vitality and activity for children, therefore, teachers tried to implement them in the field of education and to be entered into the school day programs but not out of the schools context, where some of the schools plan allocated to play games with the development of the curriculum began to use teaching methods that rely on the E-games within the school plan and began using E-games in their plan to increase learners' activities and stir up their attention specially in kindergartens and primary school stages. According to Squire (2006:19) "games experiences are changing the present generation's attitudes towards work and learning". Games are used for purposes other than

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entertainment and they were estimated in 2005 to be a$ 75 million annual industry, with a prospect to reach $1 billion by the end of this decade (Erwin, 2005).

However, the development and emergence of the technological revolution in which we live and the proliferation of computers desktop and laptop, various games such as: (play Station, Xbox, Game boy, Wii), tabs and iPods, smart phones such as IPhone, Blackberry, Galaxy. Where some newspapers and magazines noted that Saudi child spends about $400 a year on electronic games to be entertained only, so it was necessary to take advantage of this in alerting parents to buy games that are aimed to educate beside entertainment.

E-games offer potential benefits to the learning process in early childhood. Benefits offered in general by technology as summarized in (Roblyer and Doering 2009) concern with additional learning motives provided to children, unique learning facilities, support of new (or promising), literacy useful to members of the information society.

SOLO is the Structure of Observed Learning Outcomes it's a kind of taxonomy that describes the learning outcomes and makes the observation process easier because its divide the learning outcomes into three levels : i) surface knowledge, ii) deep knowledge, iii) Conceptual (or constructed) knowledge.

Biggs and Collis (1982) based their model on the notion that in any "learning episode, both qualitative and quantitative learning outcomes are determined by a complex interaction between teaching procedures and student characteristics"

The students should know the learning outcomes that they have to achieve before begin the teaching an observing process that have an impact on learning outcomes because it define what students are supposed to know , values and be able to do at the end of the course.

RESEARCH PROBLEM

The current research problem illustrated the speed of spread and development of E-games that obsessed on the mind of children. These games have spread rapidly in Arab societies in general and the Saudi society in particular, almost there is no Saudi house devoid of E-games instruments, E-games have become an essential part of a child's room.

Considering the long period of time that spent by children playing across their tablets where there are a lot of kids who have their own IPad and mobile in this young age the research tried to take advantage of these devices and try to exploit the time spent with these devices in the practice of scientific and academic electronic useful games, trying to give them the opportunity to take advantage of them so as to improve their learning outcomes, at the primary level, trying to provide them with information and experiences in an interactive contexts in this area where many studies have shown that E-games have a positive and effective impact on teaching different courses such as Nikolas Panagiotou and Jim Prentzas, Javier Torrente and etal ,Douglas B, Clark and etal and Jennifer Gro.

The main question was: what is the effectiveness of using E-games on the learning outcomes according to (SOLO) assessment among students of the fourth grade?

RESEARCH QUESTIONS

The research answers the following questions:

1. What are the E-games proposed for the development of the academic achievement and the learning outcomes of the students?
2. What are the standards of choosing the appropriate E-games on deferent courses?
3. Are there statistical significant differences between the results of the experimental group which studied using the E-games and the controlled group which studied in the

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traditional way in the learning outcomes according to (SOLO) assessment among students of the fourth grade?

4. Are there any statistical differences between the results of the pre- measurement and the post- measurement of the experimental group which studied using the E-games ?

RESEARCH OBJECTIVES

The overall objective was to discuss the effectiveness of using E-games in developing the learning outcomes according to (SOLO) assessment among students of the fourth grade. While the specific objectives were:

1. To identify the educational E-games which suitable for the fourth grade students.
2. To determine the standards of choosing the appropriate E-games on different courses.
3. To clarify the impact of using E-games on the the learning outcomes among students of the fourth grade.

THE SIGNIFICANCE & LIMITATION OF THE RESEARCH

The significance of the current research is in the following:

1. It benefits teachers and supervisors in identifying and designing appropriate E-games for the students and the developing of curriculum.
2. Also it may benefit parents to identify the positive effects of the use of electronic educational instruments in the academic achievement of their children.
3. It may help students in general to understand the curriculum retention of their learning effect for a longer period.
4. It may help programmers and curriculum developers to correlate learning outcomes to teaching methods.
5. It may benefits on Assessing student learning.

The present research is limited to:

1. the subject of educational E-games and learning outcomes using (SOLO) assessment.
2. eleventh primary school at Afif province- Saudi Arabia.
3. fourth grade students (at primary school).
4. the second semester of the academic year 2015-2016.

Definitions

Salen and Zimmerman's (2004) defined games as "system in which players engage in artificial conflict defined by rules that result in a quantifiable outcome". Also it was defined by Jasinski (2006) as "e-games are primarily containers for facilitating dialogue about different problems and issues and for encouraging the construction and sharing of new knowledge, understanding, perspectives and insights.

For the purposes of this paper, we will use Nikolaos Panagiotou definition of e-games (it is a game that employs electronics to create an interactive system with which one or more players can play).

Learning refers to the process by which the students improve in a constantly changing knowledge and skill or efficiency. In this context, the learning outcomes mean descriptive expressions of the changes that are expected to occur in the learner in the cognitive and affective skills and learning areas as a result of the learning process. So learning outcomes was known as "phrases that define what we expect is owned by the learner's knowledge and understanding of the capabilities, and can his performance skills, or shows the actions after successfully completing the learning process."

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Literature review

Different games templates are designed to facilitate different types of learning outcomes as classified by Gagne and according to Thiagarajan (1996) all e-games templates include the four critical attribute of a game, conflict (which prevents the easy achievement of a specific goal), control (rules for taking turns and scoring points), closure (special rules that specify how the game ends and who wins) and contrivance (and element of playfulness). Exploration, interdisciplinary activities, multimedia (focus attention) , interactivity are elements that characterize the positive aspects of the relation build between children and e-games. It is upon these critical attributes that educational environment can build in order to promote their goals and by the same time promote critical competences for their use by children today and as adults latter.

The E-games provides opportunities for continued practice as an attractive element of the gaming experience as a learning tool, that is because negative consequences are not typically associated with failure. However failure serves as an integral part of the learning experience. This encourages players to improve through repeated practice either by advancing within a game or replaying parts of a game. In the context of education where a game might become a required activity tied to real consequences, there could be a diminution in these key elements that may lead students to be less inclined to practice and realize some of the benefits of gaming. Games also are built with clear goals and provide immediate feedback (Dickey,2005). This allows players to change their game play in order to improve their performance and reach their goals. The idea of immediate feedback is also prominent in good formative assessment process. Students will improve their work when they are given constructive feedback (Black& Wiliam), however traditional schooling has often been labeled as boring for many students. In fact, nearly half of high school dropouts said a major reason for dropping out was that the classes weren't interesting and 70% said they weren't motivated or inspired to work hard (Bridgeland, Bilulio, and Morison,2006).

Furthermore, McClarty(2012) stated that the use of simulations and digital games in learning and assessment is expected to increase over the next several years . Although there is much theoretical support for the benefits of digital games in learning and education, there is mixed empirical support . Also her research report provides an overview of the theoretical and empirical evidence behind five key claims about the use of digital games in education, that digital games are built on sound learning principles, provide more engagement for the learner, provide personalized learning opportunities, teach 21st century skills and provide an environment for authentic and relevant assessment and gave evidence for each claim is presented and directions for future research are discussed.

Achieving new plateau will require better articulation, design, and evidence for learning goals and performance within learning games. Teachers, parents, and learners all need-and often request of game designers- a better understanding of what a game is targeting, how that situates into a larger learning sequence, and how they know what they have learned from the game. Answering these needs is not just for the benefit of teachers and parents, but in doing so we will directly benefit the learner and make a more powerful learning game. To do this, it will require a more robust learning framework at the core of the game design. Many have argued that assessment design is a key mechanism that will propel the field forward; yet there still exists a large chasm between general assessment design and even games designers leveraging rigorous assessment methodologies- and the rest of the field.

The learning outcomes assessment which called SOLO Taxonomy was developed by John Biggs and Kevin Collis it aims to analyze the structure of student responses to assessment tasks in response to given body of information or knowledge and identifying the type of

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thinking exhibited by extended written responses. SOLO has been applied in many different school subjects(University of Auckland , 2004)

And so that we can be half the evolution of the performance of students during the learning stages and define the learning outcomes that we want, we need a good tool; therefore developed Biggs classification model Solo "SOLO taxonomy" (classification structure learning outcomes observed) and is a systematic way to describe how the evolution of the performance of the learner from the simple to complex, as it is a learning models that help teachers and students to develop and understanding of the learning process.SOLO taxonomy shows students learning outcomes on five levels:

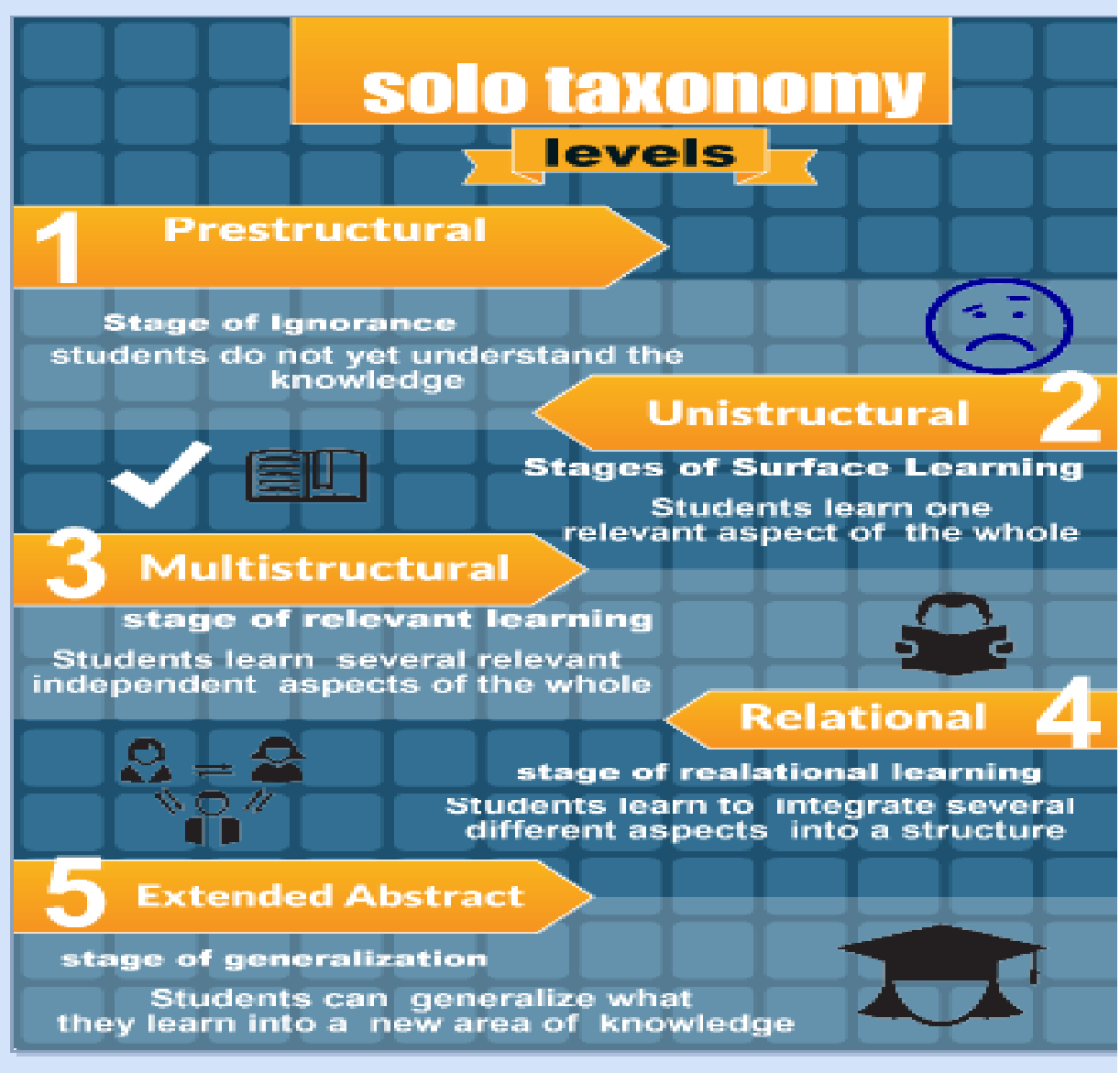

Figure 1: SOLO taxonomy levels

RESEARCH HYPOTHESES

The present research tried to test the following hypotheses:

1. There are statistical significant differences between the results of both the experimental group which studied using the e-games and the controlled group which

studied in the traditional way in the academic achievement for the experimental group.

2. There are statistical significant differences between the results of both the experimental group which studied using the e-games and the controlled group which studied in the traditional way in the learning outcomes for the experimental group.

RESEARCH PROCEDURES

To answer the research questions and test its hypotheses, the following steps have been followed:

The Research Sample

The research sample has been chosen from grade four students of the second semester for the academic year 2015-2016, registered in eleven different basic schools in Afif province - Saudi Arabia. Two groups from grade four have been chosen (A and B) where their total number is (36) students, (A=18 students) was an experimental and the other group (B=18 students) was controlled. Group (A) studied according to the E-games method, group (B) the controlled group studied according to the traditional way.

Research Approach

The current research followed the experimental method because it is appropriate for the research objectives to measure the impact of the independent variable which is the E-games on the dependent variable which is the academic achievement and learning outcomes in the lightened of SOLO taxonomy. Furthermore, the researcher used descriptive approach to review the theoretical framework.

Research Tools and Materials

The instructional materials and the measurement tools were prepared as follows:

1. Some of the electronic educational games associated with the content of the science math language studies and social studies courses lessons for grade four students were uploaded using (Google play and Store play).
2. An academic achievement overall test in science math language studies and social studies for grade four at basic schools was used.
3. An observation questionnaire sheet to assess students learning outcomes.

The researcher followed follow steps to set up the tools:

Firstly, selection of E-games

The selection of E-games on the research was made according to the following steps:

1. Task analysis: where the researchers determined the general objectives of the educational E-games, considered the impact of your motivation strategies of using E-games and what you need to develop next in this area. In order to do that the researcher followed the following steps:
   i. Content analysis of the science math language studies and social studies lessons was approved for the experimental group in order to identify the learning outcomes (concept, generalizations and skills) included in the lessons.
   ii. Testing the content analysis reliability by (reanalyzing the content) and undergo a review process by a group of curricula and structures specialist reviewers.

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iii. Preparing the teachers and students' guide by clearing the objectives of the e-games and the roles.

iv. Preparing the teachers and students' guide by clearing the learning outcomes that is expected to reach.

v. Preparing the teachers' guide and the students' exercises for each lesson studied according to the e-games.

vi. Having the teachers' guide, sheets, exercises and prepared group of reviewers including university staff members.

vii. Preparing the final form of the teachers' guide and e-games, exercise after considering the jury's observations.

2. Students Analysis: According to their educational levels, social, cultural, economic, as well as their knowledge, skills, attitudes towards science math language studies and social studies and psychological characteristics. It is also important in the selection of E-games to analyze skills, knowledge, academic and linguistic skills that should be provided in learners before the experiment.
3. Content Analysis: On the other hand, the identification and selection of the content was analyzed according to the appropriateness of the context of the lesson.
4. Analysis of Resources: Such as availability of a particular authoring program and not another or difficult to use.

Secondly: Preparing the Achievement overall Test

The researchers prepared an achievement overall tests for science math language studies and social studies lessons which have been chosen to assess the academic achievement of the students. The test has been reviewed by experts in curriculum and instructor to check the suitability of applying the test to the sample of study.

Preparing the final form of the test after considering the opinions and observations of the reviewers.

Check the achievement overall tests

A pilot group other than the main group of the study was used in order to assess the reliability coefficient which was (85%-100%) as well as the time needed for their administration.

Specify the Overall Band Score is the average of the four component scores, rounded to the nearest whole or half band. The component scores are weighted equally:

Table 1: Shows the overall test band score.

The band	Science	Math	Social studies	Language studies	
Total score	2.5	2.5	2.5	2.5	10

Marking the achievement overall test, then recording the scores and treating them statistically, then analyzing the results and interpreting them.

Thirdly: preparing the observation sheet

The researchers prepared the SOLO-Based student Observation Questionnaire. The observation sheet consists of the five SOLO stages – each stage observe number of student activities the following:

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Table 2 . Shows the observation questionnaire items and score

Observation questionnaire items	Number of phrases	Total score
Prestructural level	4	20
Unistructural level	4	20
Multistructural level	4	20
Relational level	4	20
Extended abstract level	4	20
Total	20	100

The researchers trained the teachers to observe and wrote students' activity during teaching and learning process

Provide teachers with the guidelines of the observation sheet Questionnaire, copy of the Observation Questionnaire sheet, general description of its uses and how to calculate the score.

The observation process undergo on the four courses at the same day, the time was determine by the researchers considering the suitable time for both students and teachers.

* provide students with learning outcomes.
* provide teachers with the aim of the research and the observation process.

RESEARCH RESULTS

The first hypothesis:

There are statistical significant differences between the results of both the experimental group which studied using the e-games and the controlled group which studied in the traditional way in the academic achievement for the experimental group.

Table 3: The differences between the results of the experimental group and the controlled group in the post-test.

As shown in the table above, there are some statistical significant differences between the

Sig.	t. test	d.f	St. dv	Mean	N	measurement
0.00	8.267	17	1.9267	4,777	18	Pre -test
			2.90143	9.222	18	Post -test

results of the experimental group and the results of the controlled group in the post-test.

The deferens represented as bellow:

Figure 2. differences between the results of the experimental group and the control group in the post-test

Table 4: The differences between the results of the pre and post-test for the experimental group

Sig.	T. test	df	St.dv	Mean	N	group	measurement
0.001	5.601	34	1.9449	4,611	18	controlled group	Post measurement
			2.9014	9.222	18	experimental group	

As shown in the above table, there are some statistical significant differences between the results of the pre-test and the post-test of the experimental group which studied using E-games. The deferens represented as bellow

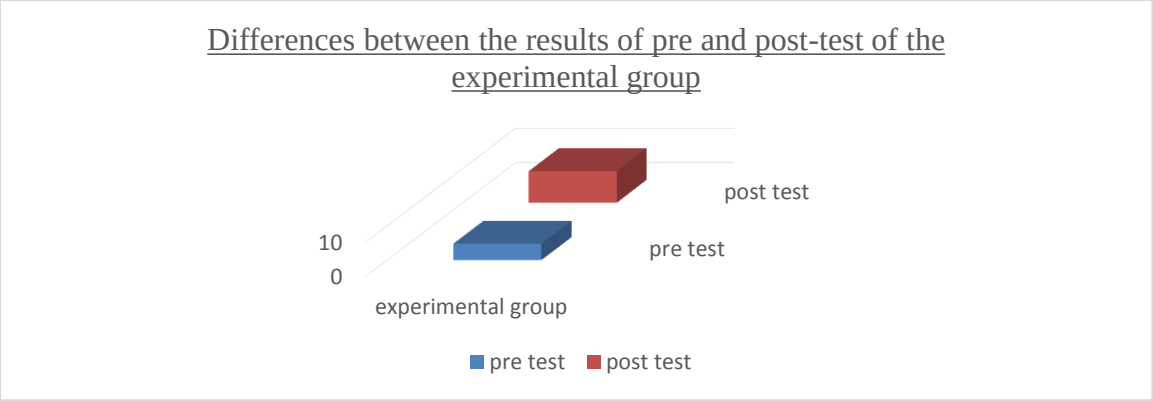

Figure 5: Differences between the results of pre and post-test of the experimental group

The second hypothesis:

There are statistical significant differences between the results of both the experimental group which studied using the e-games and the controlled group which studied in the traditional way in the learning outcomes for the experimental group.

Table 5: The results of t-test for the learning outcomes levels between the controlled and the experimental groups.

Assessment level	Group	N	Mean	St.dv	f	T test	Sig.
Pre-structural level	Controlled group	18	13.4444	1.09664	2.19	12.36	0.00
	Experimental group	18	17.5000	.85749			
Uni-structural level	Controlled group	18	12.8889	.96338	0.319	11.85	0.00
	Experimental group	18	17.2222	1.21537			
Multi-structural level	Controlled group	18	13.8333	4.40921	1.3	0.302	0.005
	Experimental group	18	17.1667	1.58114			
Relational level	Controlled group	18	12.3333	.48507	7.65	15.89	0.00
	Experimental group	18	17.2778	1.22741			
Extended abstract level	Controlled group	18	12.8333	1.04319	0.304	15.70	0.00
	Experimental group	18	17.8333	.85749			

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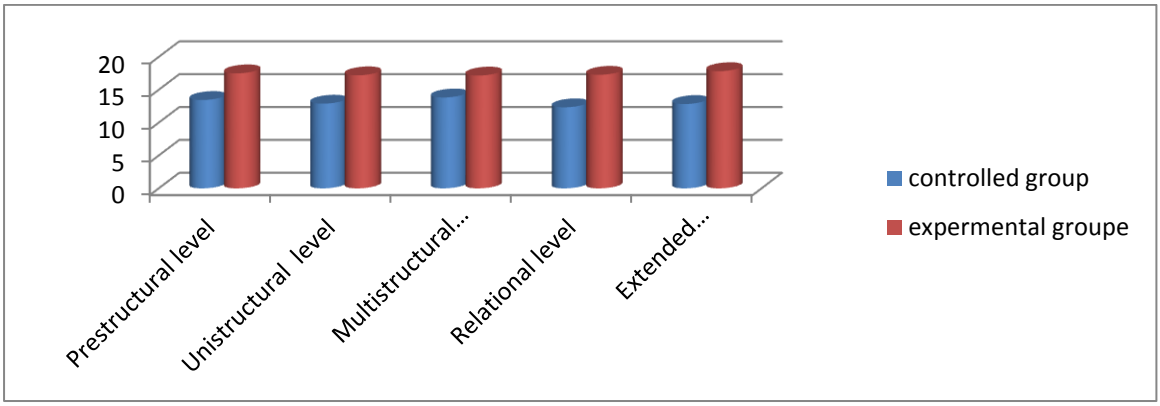

Figure 2: compare means for SOLO observation levels between the controlled and the experimental groups.

The preceding table shows that the average result of the experimental group in the post-test was greater than the average of the controlled group and that was also higher than the average of the experimental group itself in the pre-test. That is to say, E-games helped in developing academic achievement for grade four students. This result corresponds with the findings of some researchers including, McCarty, Nicolas Panagioton and Linda Stege.

Also based on qualitative data gathered from observation questionnaire sheet it was found that students made improvement while teaching-learning process. Observation result showed that the students were more active during the teaching learning process at the different levels of the learning outcomes according to the SOLO assessment to the controlled group which indicates higher average on all levels that's approve that the E-games helped in achieving learning outcomes, The E-games which make students active and motivated and also made teaching-learning process enjoyable and decreased students' boredom in studying and the focused time on task means less time is wasted that the students and teachers both focused on learning outcomes on the other hand E-games make teachers do their jobs with more impact it's an exceptional teaching tools, the ability of repeating attempt for each student according to his own ability and needs give them a chance to practice and improve with each new attempt.

RECOMMENDATIONS

Based on the results of the research which indicated the effectiveness of using E-games in developing academic achievement and learning outcomes for grade four students, the researcher suggested the following recommendations:

1. Teachers should use E-games in teaching at basic schools so as to help learners learn better.
2. Training courses on using various modern technology methods should be held for in service teachers at basic level.
3. Teachers should be trained on how to prepare a good lesson plan.
4. Faculties of education in Saudi Arabia should introduce modern methods of teaching in the methodology courses.
5. Students of the faculty of education should be given chances to practice teaching inside and outside the university.

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SUGGESTIONS FOR FURTHER STUDIES

According to the results of the present study, the researcher suggested the following:

1. Conducting some other studies and researches on the effects of using e-games on other variables such as: the attitudes
2. towards different courses, interest in it and the attitudes towards cooperative work.
3. Conducting a similar research to the present one in separated subjects such as mathematics and in other educational levels or grades.
4. 3-A comparative study of the effect of using e-games with another method of learning and using different assessment strategies and the development of problem solving skills.
5. An effective training program for science teachers of basic schools on the using of e-games method with its various types and studying its effect on their attitudes towards the subject.

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