

## The Effectiveness of package Based on Constructivism on Achievement of Mathematics

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### Abstract

The aim of the present study is to investigate the effect of package based on constructivism on Achievement in Mathematics of eighth-grade students in Amman-Jordan. The sample consisted of 140 eight-grade students, divided into two groups: one experimental and one control. The experimental group was taught by Package based on Constructivism and the control group was taught by traditional method. The results of the study indicated significant differences between the control and experimental groups in achievement in mathematics the AIMof experimental group for which the package based on constructivism, the mean score of Achievement in mathematics of experimental group was significantly higher than the control group. The study concluded that teaching through packaged based on constructivism is effective in enhancing Mathematical Achievement for attaining different objectives-understanding, application, and skills including incorporating constructivism in courses and providing training for teachers on how to use such strategies when teaching courses.

**KEYWORD:**Effect Constructivism, Achievement of Mathematics effectiveness, Jordan, lesson planning.

**INTRODUCTION:** The recent changes in the concept of teaching - learning process have led to the development of new areas of educational endeavor. Mathematics is a self-contained mental discipline, with its own language, tools, structure and mode of operations. Besides being an independent subject, it has its applications in other branches of knowledge and is a mental tool for the training and experience of intellectual functions. mathematics causes permanent changes in people's life, and affects their interpretation of the world. Mathematics plays an integral role in the lives of every member of our society. The need for mathematical knowledge is increasing as our culture becomes more saturated with technology and information. In this regard, Constructivism postulates that learners are active participants in building their knowledge and resolving their own misconceptions. Since learners will not become active by accident, but by design, constructivism sees the role of the teacher as not only to present new information, help learners correct their misconceptions, and demonstrate skills, but also to organize classroom environment and content in a way that helps learners construct their own knowledge and resolve their own misconceptions ((Ernest, 1998); (Vosniadou & Vamvakoussi, 2006); (Blake); (Cäker, 2008); (Summit & Rickards, 2013); Accordingly,

Constructivism has emerged as one of the main philosophies of mathematics education. In using constructivism as a philosophical basis of mathematics education is beneficial because there are genuine insights available that could dramatically transform the current practice of mathematics education. Reciprocally, the practice of mathematics education stands to transform and enlarge aspects of constructivism. A constructivist approach includes taking student's former knowledge into account, maximizing social interactions, providing a variety of sensory experiences, interactive discussion, and problem centered work. In constructivism the role of the teachers changes from talking and describing to listening and asking questions to the students.

**NEED AND SIGNIFICANCE OF THE STUDY:**It is generally accepted that constructivism extends its epistemological influence and ideas to education. Constructivism has emerged as one of the greatest influences on the practice of education in the last twenty-five years. The main idea of educational constructivism is that human knowledge is constructed. According to constructivism, every learner constructs his own knowledge. The constructive perspective is derived from the work of Piaget (1954, 1970, 1980). Learning occurs only when the learner is actively involved in the construction and reorganization of concepts. Second, knowledge is highly related to the environment in which the learner experiences and constructs the knowledge (Duffy & Jonassen, 1992; Resnick, 1987; Von Glasersfeld, 1996). Constructivist educators deemphasize lecturing; instead they encourage the active engagement of learners (students) in establishing and pursuing their own learning objectives (Noddings, 1998). According to Bruner (1966), a major proponent of the constructivist theory, the role of the educator is to direct and arrange activities so that students have the opportunity to search, direct, explore, and investigate. In this way, learners can learn general problem-solving skills like gathering information, formulating rules, and testing hypotheses. According to Zhao (2003), the "characteristics of constructivist teaching models include: prompting students to observe and formulate their own questions; allowing multiple interpretations and expressions of learning; encouraging students to work in groups; and in the use of their peers as resources to learning". According to Crawford and Witte (1999) the best word to describe a constructivist classroom is energy. The active engagement of students in the learning process is essential. Obtaining this type of engagement requires a much different classroom from the authoritative and teacher-centered traditional classrooms in which the teacher stands at the front of the room directing the content that is delivered to the students (Polya, 2002). (Brooks & Brooks, 1999) discuss the need to rethink this traditional classroom and the notion that students will learn on demand and that they will learn the same material at the same pace.

So, constructivist teaching methods are intended to induce learning through discovery and investigation, classified as open or discovery methods. It's important to realize that the constructivist approach borrows from many other practices in the pursuit of its primary goal, simply helping students learn how to Learn. The student creates new understanding for him/herself. The teacher coaches, moderates, suggests, but allows the students room to experiment, ask questions, try things that don't work. Learning activities require the students' full participation (like hands-on experiments). An important part of the learning process is that students reflect on, and talk about, their activities. Students help set their own goals and means of assessment.

**REVIEW OF LITERATURE:**The constructivist teaching methods require high student activity levels, and the corresponding learning methods reflect those levels. The effective constructivist education provides problems that students must handle like real-life problems and that people solve problems better through social cognition rather than alone. Constructivist course goals should provide realistic problems that elicit social cognition, facilitate student application of external knowledge sources, and encourage students to utilize scientific reasoning This has been revealed in many field studies conducted(Echevarria, 2003; Petraglia, 1998).

(**Ross, 2010**)Tried to investigate the effects of representations, constructivist approaches, and engagement on middle school students' algebraic understanding and to determine occurrences of indicators of representations, constructivist approaches, and engagement, as well as student understanding. The results of the final structural equation model revealed a model that fit the data. Constant comparison revealed similar findings concerning correlations among the indicators, as well as effects on student engagement and understanding. Constructivist approaches have a positive effect on both types of student learning in middle school mathematics.

Constructivist Approach is an effective strategy to learn mathematics, which teachers need to incorporate in their teaching.For example,(**Nayak, 2007**)aimed at examining the Effect of Constructivist Pedagogy on Students Achievement in Mathematics at Elementary Level, which studies subsequent effect on achievement in mathematics at elementary level of learners and the difference in achievements of two groups who were exposed to traditional and constructivist pedagogy respectively. The experimental data revealed two important results. Most of the students improved their abilities of understanding and reflection. They indicated that constructivist learning approach can help them to understand, integrate and clarify mathematical concept and also enhance their interest to participate in group in constructivist classroom.it also show, that adopting constructivist learning approach significantly improves students achievement in mathematics as compared to using a traditional expository teaching method as different stake holders like teachers, parents and teacher educators in favor of the constructivist pedagogy, and they suggested the present policy and classroom practice need to be changed.

(**Qarareh, 2016**)The study aimed to investigate the effect of using Constructivist Learning model in teaching science, especially in the subject of light: its nature, mirrors, lens and properties, in the achievement of eighth-grade students and in their scientific thinking. The results show there is no statistically significant differences between the means of students score in the prior achievement attributed to the teaching method and to gender. Moreover, the results show no statistically significant differences between the means of students score in the prior achievement attributed to the interaction between the teaching method and the gender.

(**Laz & Shafei, 2014**)Demonstrates that the constructivist learning model in the teaching of mathematics has a great impact in the acquisition of concepts, constructivist theory of theories that are based on building knowledge of learners, cares structural model including the learners schemes conceptual, is also interested to apply the active and effective in new situations he cares what any after learning and transfer of knowledge and

experience to take advantage of them in the construction of experiences associated with new positions. The study was applied to samples of students in the preparatory year at the University of Tabuk and the two divisions to choose at random to represent one of the experimental groups and the other control group. The result was that there were statistically significant differences between the mean scores of students of experimental and control groups in the post application to test the statistical concepts for the benefit of students of the experimental group.

#### **OBJECTIVES OF THE STUDY:**

1. To study the effective of Package Based on Constructivism (PBOC) on the Achievement in Mathematics (AIM) of 8<sup>th</sup> standard student.
2. To find out the differential effect of Package Based on Constructivism (PBOC) on Achievement in Mathematics (AIM) with respect to gender of students of 8<sup>th</sup> standard students.

#### **POPULATION AND SAMPLE OF THE STUDY:**

Multistage sampling was used to select the sample. In the first stage since there were 5 areas in Amman city random sampling technique (lottery method) was used to select the area for the experiment. In the second stage schools were chosen according to Random sampling technique (lottery method). Also, in the third stage since there were more than two sections of eight standard in both schools random sampling technique (lottery method) was used to select the sections. The students of two sections were randomly assigned as experimental group and control group in both the schools.

#### **HYPOTHESIS OF STUDY:**

1. Post-test mean scores of Achievement in Mathematics of experimental group is significantly higher than that of control group.
2. There is no significant difference between achievement in mathematics scores of boys and girls of experimental group of 8<sup>th</sup> standard student.

#### **VARIABLES OF THE STUDY:**

The details of the variables of the study are categorized into three variables. Firstly, Independent variable; Teaching with Package Based on Constructivism (PBOC) and Traditional Method of Teaching. Second, Dependent Variables: Achievement in Mathematics (AIM), Moderate variables: Gender.

#### **TOOLS OF THE STUDY**

A test of Achievement in Mathematics was adapted and used by the researcher as an instrument of the study.

#### **DESIGN OF THE STUDY**

The present study is an experimental study. To study the effectiveness of package based on constructivism on Achievement of Mathematics, the researcher adopted post-test group

design. Then the investigator taught the experimental group by PBOC and the control group by traditional method. Then the researcher administered post-test in AIM to both the experimental group and control group.

**PROCEDURE OF THE STUDY**

The researcher taught the experimental group by package based on constructivism and the control group by the traditional method. Therefore, the researcher administered the post-test of Achievement in mathematics to the experimental and the control group students.

**HYPOTHESES TESTING**

**Objective 1:** To study the effective of Package Based on Constructivism (PBOC) on the Achievement in Mathematics (AIM) of 8<sup>th</sup> standard student.

**Hypotheses 1:** Post –test mean score of achievement in mathematics of experimental group is significantly higher than that of control group.

**Table 1.** The comparative posttest means scores of Achievement in Mathematics (AIM) between experimental group and control group

Group	No of Ts	Mean	Std. Error Mean	SD	T-Value	DF	Sig.
Control.	64	133.375	1.707	13.65737	22.932	126	Significant at 0.002
Experimental.	64	173.9375	.46284	3.70274			

The table (1) reveals that there are a high significant difference between the mean of mathematic achievement post test scores in favor to the experimental group as t-value (22.932) was significance at the (0.002) level. However, the following diagram show the difference between control group and experimental group in the posttest scores.

The differences between control and experimental groups scores in the Post test is clearly shown in the figure No.1. Therefore, it is clear from the Table (5.1) that the post test scores for the Experimental group is higher than the post test scores of the control group, and it significant at level (0,002), which implies that the hypothesis No.1 has to be accepted.

The Post-test mean score of achievement in mathematics of experimental group is significantly higher than that control group because PBOC (Package Based on Constructivism) was found to be more effective than the traditional method of

teaching in enhancing Achievement in Mathematics. In PBOC method of learning, situations are based on the knowledge obtained from previous experience and previous knowledge influences what new and modified knowledge students construct from new learning experiences that they obtain. The method emphasizes learning through meaning making a series of process rather than memorization of concepts/proofs. So, this method can be practiced in the schools to facilitate meaningful learning among the students and to think constructively. This develops flexibility in thinking and reasoning skills, as students compare and contrast various possibilities in order to draw their conclusions. Students tap into their prior knowledge and experience as they attempt to solve a problem. Thus, students continually integrate new knowledge into existing knowledge, thereby providing context and creating a personal "storage room", of resources that will be available for future problem-solving needs.

**Objective 2:** To find out the differential effect of Package Based on Constructivism (PBOC) on Achievement in Mathematics (AIM) with respect to gender of student of 8th standard students.

**Hypothesis 2:** There is no significant difference between achievement in mathematics score of boys and girls of experimental group of 8th standard student.

**Table 2 The comparative posttest mean scores of Achievement in Mathematics (AIM) score of boys and girls of experimental group of 9th standard student**

Gender	No of Ts	Mean	Std. Error Mean	SD	T-Value	DF	Sig.
Boy	34	173.6471	.61166	3.56653	0.665	62	0.508
Girl	30	174.2667	.70943	3.88572			

In order to test the hypothesis 2, the achievement test was pre administered to all the Experimental group participant and after applying the teaching strategy; the same test was post administered to all the participants of experimental group. To test the validity of this hypothesis, an Independent t-test (SPSS program) was used to compare the experimental group participants' total mean scores of each gender (Boys and Girls) of the post test.

The table (2) reveals that there are no significance differences between the mean scores of each gender (Boys and Girls) in the post test of the experimental group, t. value was (0.665) by significant (0.508). Thus, the Hypothesis no.2 is accepted.

In addition, post-test scores' mean is higher in both boys and girls of experimental group in achievement mathematics scores.

The results show that there are no significant differences between the mean scores of each gender. The effective mathematics instruction seems to work well in both gender in the achievement in mathematics. The result also show classroom setting in which both

boys and girls perceive a supportive group environment, properly communicated objectives, participation and reasonable demands which are attributed to positive factors in achievement in Mathematics which in turn help boys and girls achieve higher grades. The role of the teachers is also one of the important factors in this result whereby both genders are encouraged according to their strengths i.e. encouraging girls to participate more in classroom decisions and at the same time help boys work individually since the classroom setting is a positive factor in Achievement in Mathematics.

#### **FINDINGS OF THE STUDY:**

1. Package Based on Constructivism was effective and its enhanced Achievement in Mathematics of students of Jordan.
2. Gender of students has no influence on the Effect of Package Based on Constructivism with respect to Achievement in Mathematics.

#### **EDUCATIONAL IMPLICATION:**

1. The results of the present study showed that Package Based on Constructivism was effective in improving their Achievement on Mathematics. *Therefore*, the need to execute training courses for teachers of mathematics to utilize the constructivist learning model in the teaching of mathematics, whether before or throughout the service, and construction of educational programs-based teaching and learning of Mathematics directs towards creativity in all the integrated stages of education. Pursuing professional growth and academic teachers while persuading teachers to be creative in order to attain the personal creativity where there are established understanding of the process of education and innovation, leading to the progress of the critical thinking abilities of students. Impart an opportunity for all groups of students to grasp how to think and how to learn and how to appreciate whatever they are learning and encouraging the students to apply leadership skills, which help them to evolve mathematical and statistical concepts they have. The requirement for attention to students during the task of teaching and to give him time to think and take part in activities in the classroom that permits him to be creative. The use of modern teaching technique to assist the development of statistical concepts and away from the traditional methods those focus on conservation and indoctrination and the use of teaching methods function on the development of habits of mind in teaching and learning activity for the different grades. Interest in mathematics curriculum and content presented in a modern style functions to stimulate the creative capability of the students and the continued progress of the curriculum in order to learn to reflect, and the possibility of incorporating thinking strategies, and interact with many life circumstances, through the restructuring of the educational curriculum in the configuration of new help to train students to use thinking skills. Also, the use of new methods in teaching and learning process for all phase and starting from kindergarten to graduate students, to focus on learning the skills for the future.
2. The present study revealed that there is no influence of gender on students Achievement on Mathematics respect to Package Based on Constructivism, so both boys and girls should be provided equal opportunities while studying

Mathematics and there should be no gender discrimination in teaching Mathematics

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