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Student Performance And Constructive Simulation: An Experimental Study

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Abstract

This study investigated the effect of teachers' use of constructive simulation on students' performance in Islamic studies in secondary schools, in Punjab. The study also considered the influence of gender on students' performance and teacher effectiveness. The achievement and performance ability of students taught with constructive simulation were compared with that of students taught with conventional lecture method. The study was guided by two research questions. A quasi-experimental design, specifically, pretest post-test control group design involving four intact classes were employed. The sample comprised of 200 secondary school students of 20 secondary schools run by government of the Punjab. The students in intact classes were randomly assigned either to experimental groups (constructive simulation group) or control groups (conventional method group). Two intact classes in two different schools formed the experimental groups and the other two intact classes in two other schools as control groups. Both the experimental groups and the control groups were taught the same topics. The instrument for students' achievement test in Islamic Studies was developed, validated and used for data collection. The instrument was trial-tested on a sample of 15 secondary school students who were not part of the actual study. The reliability of the instrument was determined using Kudder Richardson Formula for internal consistency and Pearson Product Movement Correlation Coefficient formula for stability. The results of the study revealed the students taught with constructive simulation performed better than those taught with conventional lecture method.. It implies from the findings of the study that there is need for secondary school teachers to adopt the use of constructive simulation in teaching as it proved more effective in improving students' achievement and teacher effectiveness in Islamic Studies. It is recommended that government bodies, stakeholders in education, Punjab school education department should organize and sponsor workshops, seminars, conferences or in-service training to train and encourage teachers on the use of constructive simulation as an innovative technique.

Keywords: constructive simulation, students, teachers, principals, secondary schools, Punjab.

INTRODUCTION

Islamic studies is expected to produce a morally literate citizenry that can perceive the religious dimension of social responsibilities in the home, the school and the entire society. The much desired sound moral education of our nation can be achieved when students acquire basic education in Islamic studies before leaving school. The knowledge obtained through sound Islamic education will lead to improvement in the moral quality of individual and society as a whole. Islamic studies is a necessary subject for tolerance, peace, national unity and development of a nation. It is implied that for any meaningful growth and development to be achieved, Islamic studies must be given adequate attention.

Islamic studies is one of the non-vocational subjects offered at all levels of Punjab education system. It is an important subject that has positive impact on human life and national development. It is not only important as a school subject but should be seen as bedrock of moral living and very vital part of life itself It appears that the value of Islamic studies in the lives of individuals and the society at large inspired its inclusion School curriculum at all the levels of educational system in Punjab.

In consequence to produce competent teachers for the basic education. The federal and state ministries of education in order to implement this policy on the training of teachers made it imperative that quality teachers should be trained. It is

regrettable to note that with the emphasis on the training of quality teachers, the results of students on Islamic studies do not give impression that all is well with the teaching method employed by the teachers.

Constructivism can be referred to as psychological theory that depicts how people learn. Constructivism argues that individuals process knowledge and meaning out of their experiences. Constructivism focuses on learning as an active process of trying to make sense of new experiences (Okereke, 2018). Constructivism can be defined as educational movement that involves teaching-learning process in which learners are guided to produce their own knowledge from their experiences. Constructivism may be taken as:

An educational movement in which instruction is designed and sequenced to encourage learners to use their experiences to actively construct an understanding that makes sense to them rather than by having information presented in a pre-organized format.

Constructivism upholds the idea that the learner is not a tabularasa, but comes to the learning environment with prior knowledge. In the process of integrating new ideas and information into already existing knowledge, the learner can structure new knowledge that becomes unique to the learner's thinking. Constructivism can also equip the learner with higher cognitive skills (problem- solving and thinking skills), affective (co-operative and solidarity), and meta- cognitive abilities that will enable the learner to cope with the events of the world

(Nwafor, 2019). Meta cognitive abilities refer to knowledge, skills and values that go beyond cognitive domain. It means people's ability to reflect on what they are doing and thinking why they are experiencing it (Clark, & Elen, 2006). It implies reflecting on experiences that can result to eventual production of knowledge.

Simulation can be referred to as a state of artificial construction of a particular set of conditions in order to study something that can exist in reality. It can be defined as the imitation of some real thing, state of affairs or process. Nwafor (2019) described it as an on-going process that represents central features of reality or real situation of something. The act of simulating something generally implies representing certain important characteristics or behavior of a selected physical or abstract system. Here we perform in real and an environment in a fresh and joyful situation.

Simulation as a concept in education can be defined as a method of instruction whereby learners are encouraged to imitate certain situation or characters with a view to build knowledge. It is described as an instructional strategy that provides opportunity for learners to construct reality or real life situation as closely as possible (NERDC, 2008). Similarly, Ndu (2020) described simulation as a concept in teaching whereby learners are engaged in a world of pretense or imitation. It is a concept in teaching -learning process which can be used to show the eventual real effects of alternative conditions and courses of action. Simulation can allow experiments to be conducted within a fictitious situation to portray the real behavior and outcomes of possible conditions (Retteberg, 2014). Simulation involves feigning or imitation of real thing or situation for a purpose of obtaining intended results. Aldrich (2021) stated various types of simulation to include live simulation, virtual simulation and constructive simulation but this study intends to focus on constructive simulation.

Constructive simulation entails a situation where motivated learners utilize simulator in a simulated environment (Aldrich, 2021). Motivated learners in the context of teaching and learning can be referred to the students who are simulated to imitate characters, state of affairs, or abstracts and processes or use model of real materials. A simulator is referred to as an abstract or model of real materials produced to be similar to the real object as closely as possible. When a simulator is operated, it gives result closely as those of real situation (Garba, 2018). In the context of learning, constructive simulation instructional model entails learning process that involves simulated activities which can represent real world situation. It features combination of constructive teaching and simulation instructional model in the learning

process. Obiekwe (2022) stated features of constructive teaching to include active involvement of learner in teaching and learning process. The emphasis is on the learner rather than on the teacher and the content, thereby making teaching - learning process learner-centered. The principle involves supporting learning as an active process whereby learners are to be allowed to discover principles, concepts and facts for themselves (Ogbonna, 2022). The learner is viewed as the ownership of the learning situation. The principle holds that the learner is perceived as a unique individual with unique needs, experience, and from a particular background and culture (Jong, 2021). The learner harnesses experiences from the environment, while the teacher the teacher is to assume the role of a facilitator. The principle considers the teacher as a coach who is expected to monitor the learning process (Bolton, 2010, Madu, 2004). The teacher considers the background and culture of the learner in guiding the learner throughout the learning process, and encourages the learner to interact with the physical environment. The teacher is expected to allow learner's ownership of the learning situation. Also, the teacher is to provide learning environment that supports and challenges the learner's thinking. The major task of the teacher is to adapt the learner's learning experiences by reflecting on them and using their initiative to steer the learning experiences where the learner wants to create value. The teacher is expected to provide the learner with meta- cognitive skills that can help the learner to produce new knowledge.

Jong (2021) highlighted the characteristics of simulation to involve problem-solving, learner-centered activities, experiential-based activities, observation, continuous monitoring, evaluation of activities and feedback. Other characteristics include reliability, validity of the decision taken and reflective practices involved (Obiukwu, 2022 & Ian, 2006). Reflection is central to constructive and simulation instructional model, for it aids the teacher to provide opportunity for individual learners (Dogru & Kalender, 2007, Hmelo-Silver 2006). It is acclaimed that constructive simulation encourages learner's active participation in the teaching-learning process and, has overwhelming effect on learning activities.

It will be a welcome change if students can find out facts for themselves through teachers' guidance. When the finding is their own handwork there will be re-enforcement of lessons learnt in their minds and lives. But the facilitation of students' active participation in the learning process lies mainly on the hands of teachers. Teachers are expected to be abreast of their specializations by attending seminars and workshops in order to be models to their students (Ezeani, 2015). There is utmost necessity for teachers to update their cognitive, affective and psychomotor knowledge constantly in the various aspects of education (Okeke , 2018). When teachers are well equipped, they will be able to guide students towards achieving the desired educational goal.

Constructive simulation instructional model refers to the process of teaching and learning that considers the principles of constructive simulation in instructional process. In the application of constructive simulation, the students under the guidance of the teacher engage to imitate real things, abstracts or state of affairs and processes as closely as possible and strive to construct new information from their experiences. Effective use of constructive simulation principles include:

Asking probing questions to motivate individual students and identifying their experiences.

Asking questions that connect the student's existing knowledge.

Using varied and appropriate instructional materials and instructional methods.

Involving students actively in instructional and learning process.

Asking questions that stimulate students cognitively

Creating democratic classroom environment that encourage free expression, collaboration and exchange of ideas.

Caring for students by accepting individual students' problems.

Challenging students with tasks and providing them with prompt for support.

Asking questions that require application of knowledge to another situation

Continuous monitoring of the learning process, evaluating and revising practices based on the feedback.

In the application of constructive simulation as a method of instruction, students are to be engaged in a world of imitation or pretense. Constructive simulation instructional model seems to consider learner's experiences and appears to inspire both teachers and learners to be committed in instructional process. Its approach can be in game or play form, in card or real human play (Ndu, 2020). Also, Nwafor (2019) added that some of its approaches can be inform of puzzle, colleague consultation or role playing, and inquiry. It appears that constructive simulation instructional model offers students opportunities to interact and participate actively in teaching and learning process. It has been established that constructive-oriented methods of teaching emphasize practical involvement of students. Constructive instructional approaches are leaner- centered and encourage active participation of learners in learning process.

Statement of the Problem

The primary purpose of teaching is students' learning. Here we shall see the role of constructive simulation as teaching strategy towards student performance besides teacher effectiveness.

Purpose of the study:

The main purpose of the study was to ascertain the effect of teachers' use of constructive simulation on students' performance and teacher effectiveness in Islamic studies. Specifically the study was set out to:

Determine the mean achievement scores of students taught Islamic studies with constructive simulation and those taught with conventional lecture method, as measured by Islamic studies achievement test.

Determine the achievement scores of male and female students exposed to constructive simulation.

Research Questions

Is there any difference in the mean achievement scores of students taught Islamic Studies using constructive simulation and students taught using conventional (lecture) method in Islamic Studies achievement test?

What difference exists in the mean achievement scores of male and female students taught with constructive simulation?

What are the mean retention scores of students taught Islamic Religious Studies using constructive simulation and students taught using conventional method?

Research Method

The research featured a quasi-experimental design, with a sample drawn from the government secondary schools of Punjab. A sample of two hundred students from 20 secondary schools participated in the study. The research tool used for the study was student achievement for ninth class students in Islamic studies. The experiment continued for five weeks.

Results

The summary of the analyzed data and the results were presented based on the research questions and the hypotheses stated in chapter one using relevant tables. Summary of the result was stated at the end of the presentation.

Research Question 1.

What are the mean achievement scores of students taught Islamic studies using constructive simulation and students taught using conventional lecture method in Islamic studies achievement test? Data relevant to this research question are presented in Table 1.

Table 1: Mean Achievement Scores of Students in Experimental and Control Groups

Groups	Pre-test N	Pre-test X	Pre-test SD	Post-test N	Post-test X	Post-test SD	Mean gain score
Constructive Simulation	120	18.65	8.83	120	75.65	12.14	59.19
Conventional Method	80	12.71	8.93	80	25.12	14.82	7.59

N=number of subjects. X=mean and SD=standard deviation.

The Table 1 indicated that the experimental group taught with constructive simulation method had post-test mean score of 75.65 with a standard deviation of

12.14 While the control group taught with conventional method had a post-test mean score of 25.12 with a standard deviation of 14.82. The mean difference for the experimental group is 59.19 while that of the control group is 7.59. This shows that the constructive simulation group has higher achievement score than the group taught with conventional method lecture method.

Research Question 2

What difference exists in the achievement scores of male and female students taught Islamic studies with constructive simulation?

Data relevant to this research question are presented in Table 2

Table 2: Mean Achievement Scores of Male and Female Students taught with Constructive Simulation

Groups	Gender	Pre-test N	Pre-test X	Pre-test SD	Post-test N	Post-test X	Post-test SD	Mean gain score
Constructive Simulation	Male	80	20.17	9.42	80	84.83	5.80	64.66
	Female	40	18.15	8.48	40	72.59	12.43	54.44
Conventional Method	Male	40	15.29	9.37	40	21.68	15.49	6.39
	Female	40	11.34	8.39	40	19.02	14.44	7.68

Table 2 showed that male students taught with constructive simulation had post- test mean score of 84.83 with a standard deviation of 5.80 while female students had post- test mean score of 72.59 with a standard deviation of 12.43. The male students had mean gain of 64.66 while the female students had mean gain of

54.44. This is an indication that male students performed better than female students.

Research Question 3

What are the mean retention scores of students taught Islamic Religious Studies using constructive simulation and students taught using conventional method?

Data relevant to this research question are presented in Table 3

Table 3: Mean Retention Scores of Students in Experimental Control Groups

Groups	Post-test score N X SD	Retention score N X SD	Mean gain score
Constructive Simulation Instruction	120 76.96 12.05	120 76.91 8.71	-0.05 .
Conventional Method	80 20.02 14.82	80 49.77 11.50	-29.75

The data presented on Table 3 indicated that the experimental group taught with constructive simulation method had retention mean score of 76.91 with a standard deviation of 8.71 while the control group taught with conventional method had retention mean score of 49.77 with a standard deviation of 11.50. The experimental group had mean difference of -0.05 while the control group had mean difference of -29.75. This implies that the constructive simulation group shows higher level of retention than the conventional lecture method group.

Findings:

The major findings of this study are as follows;

Students taught using constructive simulation performed better than students taught using conventional lecture method in their overall achievement in Islamic studies.

Male students in both experimental and control groups performed better than their female counterparts in both experimental and control groups in the Islamic Studies achievement test.

The interaction due to teaching method and gender in both groups (experimental and control groups) on students' achievement in Islamic Studies was significant.

The results of the study are under discussed according to the relevant variables of the study. It has been revealed in this study that teachers' use of constructive simulation in teaching Islamic studies has a significant effect on students' achievement in the subject. The group taught with constructive simulation method performed significantly better than students taught with conventional method. This suggests that constructive simulation instructional method has a remarkable effect on students' achievement in Islamic studies.

This finding is in agreement with some earlier research findings on constructive- oriented methods of teaching and learning, as a basic instrument for content learning. The reason for better performance of students exposed to constructive simulation might not be unrelated to students' active participation in the leaning process. It could be that the students' active participation in the learning process provided them real or near to real life experience. It could also be as a result of excitement over the new Approach that appealed to their various senses of learning. The bridging of gap from abstract knowledge to more concrete and actual participation provided the students in the

experimental group made them perform better than the students in the conventional method group. Students were encouraged to develop activities like plays or drama that vividly displays relationship between ideas, principles and concepts. This type of relationship showed connections between different aspects of abstract ideas, thereby concretizing and facilitating better representation of learning materials or processes in students' cognitive structures. It does therefore reduce cognitive load (Larkin & Simon, 1994 in Bolton, 2008). The superior performance of students taught with constructive simulation is also in consonance with a research finding that students active role in any instructional process brings about the modification of the existing knowledge and subsequent addition of new information

Contrarily, the result from the conventional instructional method intervention suggested that the method used in the majority of the Islamic studies content materials is unlikely to develop an adequate and improved achievement in Islamic studies in our secondary schools. This finding is in consistent with other research reports that stress the ineffectiveness of the conventional instructional method typically used in secondary school Islamic Studies curriculum contents.

Recommendations:

The following recommendations were made based on the findings of the study.

Since the use of constructive simulation instructional model has been found to enhance the quality of students' achievement and retention in Islamic studies, the subject teacher should be encouraged to employ the method more in the teaching of the subject. By the use of the method, the students' interest in the subject would be aroused; and they would be committed in learning the subject, with their increase in achievement and retention of the subject Suggestion for further study:

The findings of the study have generated some areas for further investigation which include to:

1. Replicate the study in other states of the federation with larger sample.

Investigate students' interest in Islamic studies. Content

With high mean achievement and retention scores recorded through the use of constructive simulation, it calls for teachers to be abreast with the distinctive characteristics of this novel teaching method with the view to enhance students' cognitive learning outcomes. There should be seminars and workshops organized by the government and professional bodies of Punjab for Islamic studies teachers in the use of constructive simulation instruction.

Teacher training tertiary institutions should train student teachers on current teaching methods.

Pre-service teachers should be trained on how to use the method. The implication is that the constructive simulation instructional model has to be included in the curriculum of special Arts/Social Science method for colleges of education and universities.

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