

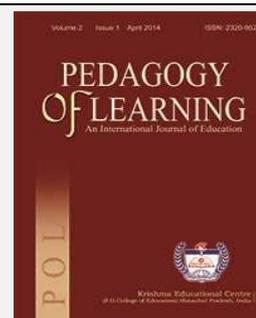
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Effectiveness of Constructivist Teaching Learning Approach on Students Achievement in Science

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Abstract

The present paper reports the effectiveness of constructivist approach on achievement in science in contrast with the traditional teacher centered approach. In this study, students of science of class VIII were divided in three groups i.e. higher score group, average score group and lower score group based on test-scores of pre-test administered. Teaching-learning processes were carried out by providing meaningful learning situations facilitating the students of all the three groups hands-on-experiences through activities, i.e. interactively engaging them, holding critical discussions giving opportunities of critical thinking and their reflections keeping in view psychology, cognition-level and interests of the students. After this intervention employing 5Es model of constructivist approach for a period of six weeks instructions, post-test was administered on all the three groups. Significant relationship is found in the approach used and achievement scores of the students. However, no significant difference is found in the scores of the students of all the three groups at 0.05 level of significance. Based on the results educational implications are suggested.

Keywords: Constructivist approach, traditional teacher centered approach, interactive engagement

INTRODUCTION

In teacher-centered education, students put all of their focus on the teacher. Teacher talks and the students listen exclusively. During activities, students work alone in an isolated manner, without peer collaboration. Traditional teaching approach (lecture method) is very common in education. Traditional method ignores the interest of the students. It involves coverage of the context and promotes rote memorization on the part of the students. It does not involve students in creative thinking and ignores active participation in the activities. The up-and-coming trends change the present scenario and adopt the constructivist approach, which is moral, and more focused on innovative activities and knowledge construction. When a classroom operates with student-centered instruction, students and instructors share the focus. Instead of listening to the teacher exclusively, students and teachers interact equally. Group work is encouraged, and students learn to collaborate and communicate with one another. Constructivism is a relatively new paradigm, which takes into account the subjective, contextual and pluralistic knowledge. In this new paradigm, learners construct knowledge in the social and cultural contexts in which they are embedded. This approach suggests that learners construct knowledge while engaged in the process of learning and the teacher's role is to engage them in the process of learning through well chosen tasks and questions. Learners actively participate to gain new experiences and to organize and integrate them with their existing experiences. During learning, experiences are gained through enquiry, activities, questioning, debates, problem solving tendencies and discussion with peers and teachers. Collecting ideas from different sources and interpreting these enable them to express their understanding in diverse ways.

Therefore, each learner has a different interpretation and constructions of knowledge process based on mental representations. Constructivism activates the student's inborn curiosity about the real world to observe how things work. In the classroom, the constructivist view of learning can point towards a number of different teaching practices. Learners, through social negotiation, continuously test their hypotheses and create new knowledge, correct previous knowledge, or confirm present knowledge. Learner linked new knowledge to prior knowledge. Constructivists argued that learner is not a blank slate (*tabula rasa*) but brings past experiences and cultural factors to construct new knowledge in given situation. In the most general sense, teacher's role is to provide meaningful learning situations. It usually means encouraging students to use active techniques (experiments, solving of real-world problems) to create more knowledge and then to reflect on and talk about what they are doing and how their understanding is changing. Learners construct knowledge based on their personal experiences and hypotheses made out of the environment. Learners actively construct or create their own subjective or objective reality. Constructivism transforms the student from a passive recipient of information to an active participant in the learning process.

RATIONALE OF THE STUDY

The traditional classroom often looks like a one-person show with uninvolved learner at large. Traditional classes are usually dominated by direct and unilateral instruction. Traditional- approach followers assume that there is a fixed body of knowledge that the student must come to know. Students are expected to blindly accept the information they are given without questioning the instructor (Stofflett, 1998). The teacher seeks to transfer thoughts and meanings to the passive student leaving little room for student-initiated

questions, independent thought or interaction between students (Virginia Association of Science Teachers, 1998). Even in activities based subjects, although activities are done in a group but do not encourage discussion or exploration of the concepts involved. This tends to overlook the critical thinking and unifying concepts essential to true science literacy and appreciation (Yore, 2001). This teacher-centered method of teaching also assumes that all students have the same level of background knowledge in the subject matter and are able to absorb the material at the same pace (Lord, 1994). In contrast, constructivist or student-centered learning (Khalid & Azeem, 2012) poses a question to the students, who then work together in small groups to discover one or more solutions (Yager, 1991). Students play an active role in carrying out experiments and reaching their own conclusions. Teachers assist the students in developing new insights and connecting them with previous knowledge, but leave the discovery and discussion to the student groups (Stofflett, 1998). Questions are posed to the class and student-teams work together to discuss and reach agreement on their answers, which are then shared with the entire class. Students are able to develop their own understanding of the subject matter based on previous knowledge, and can correct any misconceptions/alternative conceptions they have. Both teaching styles can lead to successful learning but it has been shown that students in the constructivist environment demonstrate more enthusiasm and interest in the subject matter. In fact, repeated research has found that teacher-centered lessons can be less or non-productive, and in some cases, detrimental to the students' learning process (Zoller, 2000). Many teachers are hesitant to try the constructivist model, because it requires additional planning and a relaxation of the traditional rules of the classroom (Scheurman, 1998).

During the last few decades, teacher-centered teaching style has been replaced by learner-centered teaching style in higher education (McCombs & Whistler, 1997; Weimer, 2002). In Constructivism, the learners are learning by doing and experiencing rather than depending on the teachers' wisdom and expertise to transmit knowledge (Brown, 2008). Learner-centered instruction is more suitable for the more autonomous, and more self-directed learners who not only participate in what, how, and when to learn, but also construct their own learning experiences. The learner-centered approach reflects and is rooted in constructivist philosophy of teaching (Brown, 2008; McCombs & Whistler, 1997; Weimer, 2002). On the basis of above need and justifications, the problem stated as "Effectiveness of Constructivist Teaching Approach on Achievement in Science"

OBJECTIVES OF THE STUDY

1. To study the effect of constructivist approach on the achievement of the students of class VIII on Force and Pressure, Sound and Light topics.
2. To study the effect of constructivist approach on high, average and low score groups.

HYPOTHESES OF THE STUDY

1. There will be no significant difference between traditional approach and constructivist approach of teaching on achievement of students of class VIII in Science.
2. There will be no significant difference in variation of achievements of students based on pre-test and post-test score results when taught by traditional approach and constructivist approach.

METHODOLOGY OF THE STUDY

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Design: This study was designed to find out the effectiveness of constructivist approach of teaching over traditional approaches of teaching of Science to the students of class VIII. The study was conducted on 60 students of class VIII of a rural school in Nagaur district of Rajasthan. Topics on (i) Force and Pressure (ii) Sound and (iii) Light were undertaken for transaction in the classroom employing 5Es (Engage, Explore, Explain, Elaborate and Evaluate) model of constructivist approach of teaching-learning. The learners were provided situations to engage them interactively and to explore new experiences. They were given enough scope to explain and elaborate their experiences with peer and with the teacher. Evaluation of the learning processes took place. In this study, efforts were made to find out relationship between the constructivist approach of teaching learning and achievement of students during a period of instruction of six weeks. In traditional approach of teaching teachers used lecture, command and criticism.

Population and Sample: The study is limited to Nagaur District of Rajasthan, the researchers selected a rural school of Nagaur District purposely. Population comprised of all students of class VIII of this rural school. Sixty students of class VIII of the school were randomly selected as sample.

PRE-TEST

Researchers conducted a pre-test for the selected students of class VIII. For this purpose, a test paper of Multiple Choice Questions (MCQs) consisting of 50 items was prepared with appropriate number of items on ability of observation, exploration, measurement, experimentation and drawing inferences. Each test-item examined critically the aspect for which it was developed and was relevant to test understanding of general principles of Physical Science topics i.e. Force and Pressure, Sound and Light. The science teacher of the school, who used traditional approach of teaching, was requested to evaluate the content of the test paper. The researchers explained the objectives and intention of the test paper. Reliability and validity of items was ensured. Test was administered on the randomly selected 60 students of class VIII. The total sample of 60 students was taken, to whom teacher taught the concepts of science using traditional approach. On the basis of scores obtained in the test three groups were formed.

- (i) Higher Score Group (HSG) - 25% of the sample (i.e. 15 students with higher score)
- (ii) Average Score Group (ASG)- 50% of the sample (i.e. 30 students with middle score),
and
- (iii) Lower Score Group (LSG) - 25% of the sample (i.e. 15 students with lower score)

POST-TEST

After employing an intervention with constructive approach of teaching learning with the students (N=60) of the same class for six weeks, a post test on same topics was administered on them to see the effect of this approach on their achievement. All the three groups were tested again by giving another parallel test-items to them. For this purpose a test paper of MCQs consisting of 50 items was prepared with appropriate number of items to test learners' ability of observation, exploration, critical thinking, critical reflection, measurement, experimentation and drawing inferences.

FINDINGS OF THE STUDY

Pre and post tests were administered to all the sampled students who were also categorized into three different groups after pre-test on the basis of their scores. After pre-test, t-test was used to check difference between both groups. After post-test, t-test was used to find the effectiveness of either constructivist or traditional method of teaching. ANOVA was employed to compute the significant difference from the calculated mean of total score of the post-test to find the effectiveness of either constructivist or traditional method of teaching.

The following findings were drawn from the analysis of data taken through pre-test and post-test. The statistics of Table-1 shows mean scores and Standard Deviation (SD) of higher, average and lower score groups in pre and post tests.

Table-1: Mean score and SD of three groups

	Higher Score Group		Average Score Group		Lower Score Group	
	Mean (N=15)	SD	Mean (N=30)	SD	Mean (N=15)	SD
Pre test	30.13	5.48	17.63	6.11	4.20	8.75
Post test	41.66	4.73	38.00	4.92	38.46	4.40
t-value	6.16		14.21		13.54	
Table value at .05	2.05		2.00		2.05	
Table value at .01	2.76		2.66		2.76	

Mean and SD score of higher score group are found to be respectively 30.13 and 5.48 in pretest while 41.66 and 4.73 respectively in post test. Calculated mean score of higher score group is higher in post test with less variance. Similar results are found for mean scores and SD of average score and lower score groups.

Improvement is found in the post test scores of all the three groups with a high degree of improvement for lower score group t-test shows significant difference between pre test and post test scores for all the three groups.

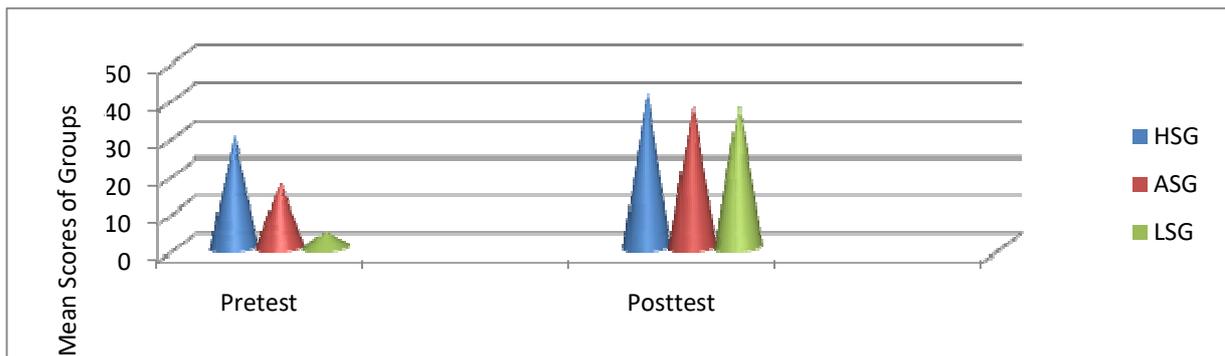


Figure 1 - The mean scores of pre-test and post-test of groups

The mean scores of higher score average score and lower score groups of pre test and post test are displayed in Figure 1.

To test the effect of the intervention with this approach on all the above three classified groups, ANOVA was employed to compute the significance of difference from the calculated mean of total score of the post test. Results found are shown in Table-2.

Table-2: Analysis of variance of three groups on post test achievement

Sl. No.	Sources of Variance	d.f.	Sum of Square	Mean Sum of Square	F-Value
1	Between the groups	(3-1) = 2	140.87	70.43	2.40
2	Within the groups	(60-3) = 57	1671.07	29.31	

Table value is 3.15, at 0.05 level of significance

Table value of F at level of significance .05 is 3.15 while calculated F-value is found to be 2.40 which is less than the table value. Hence, there is no significant difference amongst three groups formed based on pre test.

The hypothesis was rejected as three groups formed based on pretest scores, were not showing significant difference in post test scores. It, therefore, shows significant difference between effect of traditional approach and constructivist approach of teaching learning on achievement of learners. It appears that in constructivist approach of teaching-learning students have opportunities to express their ideas and when these ideas are incorporated into next learning activities; the students learn more and develop a better learning attitude or rather the way how to learn. They invariably score high. A significant relationship is found between methods of teaching and achievement scores of students learning science.

CONCLUSION AND IMPLICATIONS

There is significant improvement in the post-test mean scores of all the groups after employing constructivist approach of teaching learning over those obtained in the pre test scores of students exposed to traditional approach, moreover, variations in post test mean scores of all the groups are insignificant which were highly significant in the pre test mean scores. Use of constructivist approach is very effective than the traditional approach of teaching science. Teachers should be oriented towards the use of constructivist approach to facilitate learning of science concepts. In recent years, more teachers have moved toward a student-centered approach. However, some students maintain that teacher-centered education is the more effective strategy. In most cases, it is best for teachers to use a combination of approaches to ensure that all student needs are met. Teachers know their classroom better than anyone, so let them decide what works best for them and their students.

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