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Constructivist approach way to promote self-concept and achievement in science of upper primary students

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Abstract
The present research shows that in changing from a traditional 'chalk and talk' method to a constructivist approach of teaching method not simply enriches class room teaching, it also significantly improves their achievement. It implies that constructivist approach of teaching method proves to be more tangible in its effectiveness on achievement than the traditional classroom approach. It seems more practical and is widely acceptable to students. The method suggests a new role for the teacher. A teacher accustomed to being the sole source of information for teaching the passive learners in the classroom, has to change to be a facilitator in the learning process to actively encourage the students to: help each other and learn from each other, participate in discussions. Learning the discipline of science is a basic human necessity. It is a right of every human being as well as a duty. This is because science has permeated every aspect of human life that it is almost impossible to be insulated from it. It establishes an important and essential relationship between man and his environment. In spite of all prescription many school students find difficulty with learning of science because there is a huge gap between the prescription and practice of science curriculum. Traditional teaching practices compel the learner for rote learning and not much time is devoted to construct concepts of science. Hardly students are allowed to ask questions in the class and the teacher acts as the ring master where the students are treated as passive listener. A major reason of failure in science is that teacher quite often pays no attention to basic concepts. Conventional methods have been used for many years but the interest towards science had decreased for which we must face lots of bad consequences. To overcome these consequences our educationists has made a modern teaching method i.e. constructivist approaches. Today teachers are seeking learner-centered approaches to help motivate students to learn and increase their excitement and interest in learning through new teaching strategies like constructivist approaches.

Keywords: constructivist approach, self-concept, achievement test.

Introduction

Education is dynamic in nature and has passed through many ages and stages. From ancient past till the modern times it has been a long way for human being to gather experiences from the various facets of nature. Human beings have left no stone turned in explaining the mysteries of nature and gaining newer vistas of knowledge. Now the time is changing too fast touching all aspects of human life, we cannot just follow conventional approach of teaching learning and tied with the past. We must acknowledge the responsibility of preparing our children for the mammoth task waiting for them in a world where the pace of sweeping changes could be much fast than that of our imagination. one conclusion that can be drawn from these international studies is that, although aspects of the overall structure of the school system without doubt account for some differences in learning outcomes, it seems to be the more proximal predictors such as different instructional practices which explain most of the differences between students achievement (see also Hartel, Walberg & Weinstein, 1983 [13]; Scheerens & Bosker, 1997) [12]. These necessities the perpetuation of qualitative education of a child through conventional mode of teaching, where teacher acts as a mere transmitter of information to the learner using chalk and talk method. With the dawn of 21st century there is a paradigm shift of approach from behaviourist to constructivist.

Traditional epistemology is mainly about teaching theories. They include concepts such as "behaviourist, objectivist, and positivist." although each carries a different vision of methods and teaching techniques, they all an all carry the notion of delivering content from a teacher-centered perspective. Their sole purpose is to help learners' master facts, accomplishments, and relationships that are inherent in a specific knowledge domain. In other words, traditional epistemology tends to focus attention on students' performance rather than on the reasons that prompt them to respond or act in a particular way (Von Glasersfeld, 1994).

The constructivist approach is based on the premise that science is a human construction. As far as learning is concerned, the constructivist approach accepts that children construct or change their representations about the environment in which they live, mainly through three processes: interaction with adults, interaction with their peers, and their personal experiences (Kokkotas And Vlachos, 1998) [11]. In brief, constructivism argues that learners actively construct meaning from existing knowledge structures, and highlights the importance of children's existing ideas in the teaching process. Constructivist theory has its roots in a number of disciplines, including philosophy, anthropology, psychology, sociology, and education. Entrenched in learning theories advanced by Dewey, Piaget, Vygotsky, Bruner, and Glasersfeld, and the essential element of constructivism is active construction of new knowledge by the learner based on their experiences.

The new paradigm, "constructivism," is a psychological philosophical perspective contending that individuals form or

construct much of what they learn and understand (Shunk, 1996) [10]. It is a descriptive theory that highlights the way people learn or develop rather than the way they should learn (Richardson, 1997) [9]. based on the idea that learners construct their learning to previous learning, Limón (2001) states that research on conceptual change explored students' prior conceptions overall about scientific phenomena and instructional strategies were developed to promote conceptual change.

It was jean piaget first who set the foundations in constructivism by stating that knowledge does not have the purpose of producing representations of an independent reality, but rather has an adaptive function (Von Glasersfeld, 1996) [16]. The cornerstone of his epistemology was that cognitive development was alongside the biological development of an individual. Thus, mental functions were mainly considered as internal. the gap that constructs a "disequilibration" between adapted and unadapted responses in activating the schemata is regarded as a means for conceptual change (Limón, 2001, Woolfolk, 2001) [7].

It is Vygotsky's sociocultural constructivism that asserts that knowledge is constructed through interactions in the social world. It abandons the traditional views, introduces a new range of theoretical departures, and values shared as opposed to individualist value investments (Gergen, 1994) [15]. in addition to the above, it provides with learning environments in which group discussion or social negotiation, inquiry, reciprocal teaching, humanistic education, computers, and hypermedia are utilised (Woolfolk, 2001) [7]. Then, it is indispensable that the socio-cultural aspects exposed in the classroom interfere with learning and lead to a new knowledge construction on how to deal with forthcoming issues. Critical thinking, problem-solving, development of metacognitive skills, and information processing seem to be the aspects that play a crucial role in such conceptual change.

Jadallah (2000) [4] suggests a planning process that integrates cognitive and social constructivism in conducting social studies so that the abstract constructivist ideas of knowledge and experience are more openly defined through curriculum making and instructional planning. On the other hand, Windschitl (1999) [6] refers to the increasing popularity of constructivist learning by emphasizing its effects on teachers, including increased demand on subject-matter understanding. The researcher asserts that teachers must continually struggle to develop a new, well-articulated rationale for instruction decisions. Such shift, the author argues, cannot be realised by utilising previous teaching or learning.

Statement of the Problem

In the light of foregoing discussion, perceiving a need of research on the effectiveness of constructivist approach of teaching, it was proposed to conduct a study with the title:

"Constructivist approach way to promote self-concept and achievement in science of upper primary students"

Objectives of the Study

The Study was conducted with the following objectives:

- To study the effect of constructivist approach (Ca) on upper primary students' self -concept.
- To study the effect of constructivist approach (Ca) on achievement in science of the upper primary children.
- To compare the academic achievement in science of girls and boys taught with constructivist approach (Ca).

Hypothesis

Keeping in mind the need, aim, and objectives of the problem in mind the following hypotheses were formulated to facilitate study.

H1: Students taught through constructivist approach (Ca) will have better self-concept than their counterparts taught through traditional approach.

H2: Students taught through constructivist approach (Ca) will gain high achievement in science as compared to their counterparts taught through traditional approach.

H3: There is no significant difference between achievement in Science of boys and girls taught through constructivist approach.

Population and Sample

The term 'population' is used in research to describe any group of individuals, events or observations in which the researcher is interested. In the present study, the term population refers upper primary (vi-vii) year students studying in Karandighi upper primary, Uttar Dinajpur. The accessible population will comprise both boys and girls studying in Karandighi upper primary, Uttar Dinajpur.

A sample is a finite part of a statistical population whose properties are studied to gain information about the whole (Webster, 1985). When dealing with people, it can be defined as the set of respondents (people) selected from a larger population for the purpose of a survey. In majority of the studies, it is just not feasible to collect data from each and every subject. In addition, to work on a sample saves time, labour and money.

Sampling makes it possible to draw valid generalisation by studying a relatively small proportion of the population selected for observation and analysis. While selecting the sample for the present study, the researcher adopted the purposive sampling method. In the present investigation, science upper primary was the field of study. The sample of the study comprised 30 pupils each studying in two sections of the science section of Karandighi upper primary, Uttar Dinajpur. One section formed the control group and the other section formed the experimental group, as shown in table.

Table 1: Sample of Study

Sl. No.	Groups	Total No. Of Students
1	Experimental Group	50
2	Control Group	50
	Total	100

For this research work the researcher used 100 students as sample from two sections of that upper primary. The students of section a were considered as control group and student of section b as experimental group.

Tools and Techniques

In order to collect the relevant data for the present study the following tools were used by the researcher.

A. Measuring Tools: Tools which measure the effect of some input/output treatment.

- Science achievement test (sat)–developed by the researcher
- Self concept scale–developed by Dr. Raj Kumar Saraswat.

B. Instructional Techniques: Techniques which used for providing instruction in the classroom

- 5e' Learning model: for experimental group
- Traditional method of teaching (Tmt): for control group

Analysis of Data

Hypothesis 1

The difference between the post-self concept scores of experimental and control groups

After the study, the effect of constructivist approach and traditional approach on self concept of the students was determined. The actual scores of the two groups were treated.

The difference between the post-achievement scores of experimental and control groups

Sl No.	Groups	N	Mean	Sd	T-Value	Df	Level of Significance
1	Control	50	178.33	23.31	0.476	70	Not Significant
2	Experimental	50	178.36	23.31			

Table shows the difference in the post-self concept scores of the experimental and control groups.

As shown in the table, the students exposed to constructivist approach-based experiments had a post-test mean score of 168.36 and a standard deviation of 23.31while the group exposed to traditional experiments had a mean score of 178.33 and a standard deviation of 23.31. Hence, there is no significant difference between achievement scores of the two groups after the study. After the treatment, the two groups of respondents did not varied statistically in terms of their self concept. It also signifies that constructivist approach-based experiments as a tool in teaching science did not enhance self concept of students than the traditional experiments.

The difference between the pre and post self-concept scores of the students exposed to constructivist approach-based experiments

The difference between the pre and post-achievement scores of the experimental group

Sl No.	Test	N	Mean	Sd	T-Value	Df	Level of Significance
1	Pre Test	50	172.05	25.65	0.953	70	Not Significant
2	Post Test	50	172.36	25.73			

The pre and post achievement test were administered in order to determine whether was a significant change on the self concept of the students as a result of using constructivist approach based experiments as a tool in teaching science. Table above shows the difference between the pre and post achievement scores of the experimental group. Before the conduct of the study, the mean score of the students was 172.05 with a standard deviation of 25.65 which was almost same to 168.36 with a standard deviation of 25.73 after the conduct of the study.

There is a no significant difference between the pre and post achievement scores of the students exposed to constructivist approach-based experiments. It also suggests that constructivist approach based experiments as a tool in teaching science did not enhance their self concept.

For Hypothesis 2

The Difference between the Pre-Achievement Scores of Experimental and Control Groups

The pre-achievement test was conducted to find out if both groups of respondents' possess the same cognitive level before the conduct of the study.

The Difference between the Pre-Aachevement Scores of Experimental and Control Groups

Sl No.	Groups	N	Mean	Sd	T-Value	Df	Level of Significance
1	Control	50	14.51	6.94	0.152	70	Not Significant
2	Experimental	50	11.96	8.00			

Table shows the difference between the pre-achievement scores of the two groups of respondents. it can be gleaned from the table that the experimental group had a pre-test mean score of 11.96 and a standard deviation of 8.00 while that of the control group had a mean score of 14.51and a standard deviation of 6.93.this means that there is no significant difference between the pre-test mean scores of the two groups of respondents. This only means that the two groups of respondents have the same cognitive level before the study was conducted.

The Difference between the Post-Achievement Scores of Experimental and Control Groups

After the study, the effect of constructivist approach and traditional approach in science laboratory teaching was determined. The actual scores of the two groups were treated.

The difference between the post-achievement scores of experimental and control groups

Sl No.	Groups	N	Mean	Sd	T-Value	Df	Level of Significance
1	Control	50	32.39	6.09	5.55	70	Significant At 0.01 Level
2	Experimental	50	37.06	3.69			

Table shows the difference in the post-achievement scores of the experimental and control groups. As shown in the table, the students exposed to constructivist approach-based experiments had a post-test mean score of 37.06 and a standard deviation of 3.609while the group exposed to traditional experiments had a mean score of 32.39 and a standard deviation of 6.09. This means that the null hypothesis is rejected. Hence, there is a significant difference between achievement scores of the two groups after the study. After the treatment, the two groups of respondents varied statistically in terms of their science achievement. It also signifies that constructivist approach-based experiments as a tool in teaching science did enhance better achievement of students than the traditional experiments.

the higher post-achievement score of the experimental group can be attributed to the fact that the students were highly motivated to play an active part in their acquisition of knowledge giving them an active role in their own learning which made them perform better academically after the study.

The difference between the pre and post achievement scores of the students exposed to constructivist approach-based experiments

The difference between the pre and post-achievement scores of the experimental group

Sl No.	Test	N	Mean	Sd	T-Value	Df	Level Of Significance
1	Pre Test	50	16.95	7.99	8.481	70	Significant At 0.01 Level
2	Post Test	50	37.05	3.68			

The pre and post achievement test were administered in order to determine whether was a significant change on the achievement of the students as a result of using constructivist approach-based experiments as a tool in teaching science. Table above shows the difference between the pre and post achievement scores of the experimental group. Before the conduct of the conduct of the study, the mean score of the students was 16.95 with a standard deviation of 7.99 which was increased significantly to 37.05 with a standard deviation of 3.68 after the conduct of the study.

There is a significant difference between the pre and post achievement scores of the students exposed to constructivist approach-based experiments. It also suggest that constructivist approach based experiments as a tool in teaching science did enhance achievement. The students performed better as a positive effect of the approach that was employed.

Furthermore, it was also observed that during the conduct of the study, students showed willingness to undertake new tasks, initiative new ideas related to classroom activities, project and adapt easily to changes in procedures.

The difference between the pre and post achievement scores of the students exposed to traditional experiments

The pre and post achievement test were administered in order to determine whether there was a significant change on the achievement of the students as a result of using traditional experiments as a tool in teaching science.

The difference between the pre and post-achievement scores towards science of the control group

Sl No.	Test	N	Mean	Sd	T-Value	Df	Level of Significance
1	Pre Test	50	14.51	6.83	7.732	70	Significant At 0.01 Level
2	Post Test	50	32.38	6.09			

Table shows the difference in the pre and post-achievement scores of the control group .the table reveals that the students in the control group obtained a pre-test mean score of 14.51 with a standard deviation of 6.83 and a post-test mean score of 32.38 with a standard deviation of 6.09. There is a significant difference between the pre and post achievement scores of the students exposed to traditional experiment. The result presented in the table implies that there was a significant increase in the mean scores of the students after the conduct of the study. This means that traditional experiments are also capable of improving the student's performance in science and should not be discarded as one of the approaches employed to be employed in science teaching.

In the event of the study, it was observed that students were also participative and enthusiastic in performing the activities which were undertaken in the subject.

For Hypothesis 3

Summary of achievement test of boys and girls of experimental group

The difference between post-achievement scores of boys and girls of the experimental group

Girls		Boys		
Mean	S.D.	Mean	S.D.	T-Value
38.83	3.30	36.16	3.60	0.039

From the above table it is cleared that there is no significant difference between achievement among boys and girls which proves the third hypothesis. It is shown below through the graphical presentation.

Findings of the Study

1. After the treatment, the two groups of respondents did not varied statistically in terms of their self concept.
2. The constructivist approach-based experiments as a tool in teaching science did not enhance self concept of students than the traditional experiments. There is a no significant difference between the pre and post achievement scores of the students exposed to constructivist approach-based experiments.
3. There is no significant difference between the pre-test mean achievement scores of the two groups of respondents.
4. After the treatment, the two groups of respondents varied statistically in terms of their science achievement.

5. There is a significant difference between the pre and post achievement scores of the students exposed to constructivist approach-based experiments.
6. The result implies that there was a significant increase in the mean scores of the students after the conduct of the study. This means that traditional experiments are also capable of improving the student's performance in science and should not be discarded as one of the approaches employed to be employed in science teaching.
7. It is cleared that there is no significant difference between achievement among boys and girls

Discussion of the Findings

The major finding regarding 1st research question i.e. the self concept of the students were found to almost same before and after the treatment. There is no significant difference between self concept scores of the two groups after the study. After the treatment, the two groups of respondents did not varied statistically in terms of their self concept. It also signifies that constructivist approach-based experiments as a tool in teaching science did not enhance self concept of students than the traditional experiments. Students taught through constructivist approach (Ca) didn't have better self-concept than their counterparts taught through traditional approach. Still studies are being conducted regarding the effect of methodology of teaching on self-concept of the student.

In case of the 2nd research question major findings indicate that the two groups of respondents have the same cognitive level before the study was conducted. after the treatment, the two groups of respondents varied statistically in terms of their science achievement. It also signifies that constructivist approach-based experiments as a tool in teaching science did enhance better achievement of students than the traditional experiments. it is also inferred that traditional experiments are also capable of improving the student's performance in science and should not be discarded as one of the approaches employed to be employed in science teaching but students performed better as a positive effect of the constructivist approach that was employed. Students taught through constructivist approach (Ca) gained high achievement in science as compared to their counterparts taught through traditional approach.

For the 3rd hypothesis cleared that there is no significant difference between achievement among boys and girls taught through constructivist 5e model. These findings are same with X. Ma and J. Xu (2012). No difference was found between achievement in science of boys and girls taught through constructivist approach.

Educational Implications

The study will provide empirical evidence of effect of teaching strategy on learning achievement and attitude. If the study will show positive effect of constructivist approach as found by many foreign studies it will have educational implications for teachers, educational planners and curriculum framers of the state.

The present research shows that in changing from a traditional 'chalk and talk' method to a constructivist approach of teaching method not simply enriches class room teaching, it also significantly improves their achievement. It implies that constructivist approach of teaching method proves to be more tangible in its effectiveness on achievement than the traditional classroom approach. It seems more practical and is widely acceptable to students. It also reduces individual differences and enables all types of students to perform better. it has many other advantages. The method suggests a new role for the teacher. A teacher accustomed to being the sole source of information for teaching the passive learners in the classroom, has to change to be a facilitator in the learning process to actively encourage the students to: help each other and learn from each other, participate in discussions.

The study provides potential inputs for teacher education. Given the current widespread use of constructivist teaching method at all levels and for all subjects, it is imperative that teacher educator should learn the new technology. Besides training of teacher educator in the making, teacher educator training may also be given to the existing teachers to refurbish their acumen for teaching, that is teaching effectively and meaningfully.

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