

Role of Constructive Teaching Approach in Science Teaching for Sustainable Development

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Abstract: For hundreds of years there does exist a long term sustainability of economic and cultural systems in human societies. They are living as healthy and happy individuals in stable communities and caring families and have shown that it is possible to live in harmony with the natural world. This is possible because of indigenous system of education which established a human and natural ecology totally at one with each other. The native people love and respect the land as a mother, they believe that plants, animals, water, wind all are essential part of ongoing life cycles. Various ways includes direct instruction, stories, dances, ceremonies and art through which the beliefs and knowledge flows and pass down the generations. These all are part of indigenous approaches to education that link people to the land through culture and through culture to land. Knowledge about plants and animals, the functions of ecosystems and the way people use resources is taught mainly through science subject to school students who are the future nation builders. The science subject supports the prudent management of the encouragement and development for the daily survival and future development of humanity. In other words science helps in achieving sustainable development which meets the needs of the present without compromising the ability of future generations to meet their own needs. Here teachers play very important role and are indispensable to changing pupils' attitude so that they develop the capacity to assess and address their sustainable development concerns. The most stimulating and engaging teaching and best learning occurs when science is brought to life and pupils are given the chance to conduct, record and evaluate their own investigation. Children construct knowledge better through their own exploration. While teaching science it should be kept in mind that methods of teaching science should be innovative. Constructivism is a theory which assists learners to construct knowledge of their own which in turn results in better learning and developing the confidence among students which plays an important role in understanding the key concepts related to sustainable development. The present paper deals with a study conducted to compare the effect of constructive teaching and traditional teaching on academic confidence of students. The objectives were to study the effect of constructive teaching approach in science teaching on secondary school students in terms of academic confidence for sustainable development. Various constructive teaching techniques were enlisted and some constructive strategies were developed. The sample of 200 students was raised randomly from schools of Jalandhar district. After administering the pre-test on the whole sample, the experimental group was taught with these constructive techniques and the control group was taught with traditional techniques. After the experiment the post-test was conducted on the whole sample. Data collected was tabulated and statistically analyzed. It was concluded that constructive teaching was better than conventional teaching. The paper explains how various constructive techniques can be used to minimize cramming and help students explore themselves. It can also be used to bring out the inhibit talent of student and increase his confidence. It was observed that students showed keen interest in the subject of science when taught with constructive teaching approach. It is suggested that constructive teaching strategies should be introduced as the part of curriculum of teacher training programs so that the students as well as teachers may play an effective role in achieving sustainable development in our knowledge based society.

Keywords: Constructive teaching, Sustainable development, Academic confidence

Introduction

Education is a substantial force behind the human development. It is the means through which sustainable development can be achieved. Teacher is a pivot in this process of lifelong dynamic educational development. For the fullest growth of human beings, teacher has to be dynamic, vigilant, creative and innovative. The most stimulating and engaging teaching and best learning occurs when pupils are given chance to conduct, record and evaluate their own investigations. Educational technology originated with audio-visual age, proceeded towards information age, computer age, digital age and then interactive age. Smart interactive teaching techniques gave birth to "Edudemic". The present day teaching needs to be instrumental in developing such techniques where theoretical inputs in education are to be integrated with technologically advanced practices in teaching. Educationists who studied conventional versus constructive teaching concluded that constructive teaching is more effective than traditional teaching in terms of academic achievement.

Conventional Teaching Approach

Conventional teaching focused on the subject and the content. Teachers used to regard students as having knowledge pits that need to be filled with information but constructive teaching is based on the belief that learning occurs as learners actively involved in a process of meaning and knowledge construction rather than passively receiving information. Conventional teaching is the oldest method given by idealistic philosophy. In this teaching stress is on rote learning, rote memorization and cramming. Discipline is rigid and essay type examination is taken for evaluating the students. The characteristics of conventional or traditional teaching are: a) Conventional teaching works on the highest order of cognitive objectives. b) It emphasis on the intellectual development of the child. c) Acquisition of the knowledge is the main aim. d) Curriculum is subject-centred in conventional teaching, it emphasizes merely on the intellectual development. e) Teacher is active and students are passive recipient of knowledge. Teacher is an instructor and students have to listen what teacher is saying. f) Traditional teaching stresses on rote learning, rote memorization or cramming. g) Discipline is rigid. h) It emphasis the use of force and punishment. i) Examination system deals with essay type examination which encourages rote learning and training. Conventional teaching imposes content on the child and does not make him a learner.

Constructive Teaching Approach

As a philosophy of learning, Constructivism can be related to the eighteenth century and the work of Neapolitan Philosopher Giambattiste Vico; who held that humans can only clearly understand what they have themselves constructed. Some great theorists such as Dewey, Montessori, Piaget and Vygotsky are constructivists at root (Ornstein & Scarpaci, 2012). Learning is strongly influenced by the learners' developmental stage, thus individual in nature (Piaget, 1973) while Vygotsky believed that learning is social in nature and it involves interaction between the learner and the teacher, and even among the learners (Vygotsky, 1978). Its underlying principles are also influenced by the developmentalist ideas of the French philosopher Rousseau and later by the theories of Dewey, Hall, Gessell and Constructivists like Drever, Posner, Novak, and Osborne (Bell, 2005). They assumed that learning is an adaptive process in which learners' conceptual schemes are progressively reconstructed so that they are in keeping with a continually wider range of experiences and ideas suggested by Dewey (1916). Education depends on action from where knowledge and ideas emerges. These situations can occur in a social context, such as a classroom, where students work and gain their knowledge together.

Constructivism is not a particular pedagogy. It is basically a theory based on observation and scientific study which says that through experiencing things and reflecting on those experiences pupils construct their own concepts and knowledge about the world (Powell et al., 2009). However, Constructivism is often associated with pedagogic approaches that promote active learning or learning by doing (Richardson, 2003). Constructive teaching is based on five E's i.e. engage, explore, explain, elaborate and evaluate. It believes that one constructs knowledge from one's experiences and mental structures. Taber (2000) concluded that constructivist teaching approach helped the students to make their own sense by constructing a meaning that matches their existing ideas. Zhang (2002) investigated two models of training on the cognitive gain. The result showed that constructivist model of internet training produce a greater cognitive gain for pre-service teachers. The characteristics of constructivist teaching are: a) Learners actively participate in classroom discussion. b) Learning environment provide multiple representations of reality and collaborative construction of knowledge through social negotiation. c) Teaching based on active interaction among students. d) Teacher facilitates a process of learning in which students are included and explore their innovative ideas. e) Encourage the spirit of questioning by asking thoughtful, open-ended questions and encourage thoughtful discussion among students. f) Use raw data and primary sources, along with manipulative, interactive physical material. g) Use cognitive terminology such as "classify", "analyze" and "create" when framing tasks. h) Don't

separate knowledge from the process of finding out. i) Students develop divergent thinking for discovering new things.

Chen (2003) expressed his views in relation to a constructivist approach to teaching. He explained that rapidly increasing complex business requires college graduates to use multiple and complex skills. Conventional teaching strategies that mainly consist of lectures may not be effective to prepare these students for good jobs. According to Meyer (2009), Constructivism appears to be gaining ground rapidly and it has become an integral part of the pedagogic mainstream. The study of Gondogdu (2010) showed that authentic learner centered activities based on constructivist teaching approach were more effective and have long lasting effect on the attitudes on learners toward human rights. Khalid et.al (2012) opined that constructive teaching is more effective than conventional teaching in teacher education at science College Township, Lahore. Hence such approaches can be widely used as an effective tool both for cognitive and effective development of learners.

Quasi-experimental design was used and findings revealed that the constructivist instructed students had high score on the post test as compared to students exposed to conventional teaching.

Academic Confidence

Academic confidence is belief in oneself that he has perfect ability to succeed academically. It is a mediating variable between the individual's inherent abilities, their learning styles and the opportunities afforded by the academic environment of education. Academic confidence affects performance outcome. Academic confidence in some way protects against negative anxiety effects by showing good performance. Research has shown that people with positive self views can overcome great obstacles to achieve success while people with negative self-conceptions fail to reach their fullest potential. Similarly a student with good academic confidence will show good academic performance.

Statement of the Problem

From the above studies investigator realized that constructive teaching and Academic confidence are the current topics in the field of education. Researches on effect of constructive teaching on academic confidence of students are negligible. So a study was undertaken to study the Role of constructive approach in science teaching for sustainable development.

The objectives of the study were: a) To assess the Academic confidence among secondary school students. b) To compare the academic confidence of students of experimental and control group. c) To enlist the various constructive methods of teaching. d) To develop Power Point presentations, Videos, Modules and Dramatization constructive strategies. e) To compare the effectiveness of constructive teaching and traditional teaching among secondary students. f) To study the effect of constructive teaching on academic confidence.

The present study tested the following hypotheses: a) There is no significant difference in the academic confidence between girls and boys. c) There is significant effect of constructive teaching approach on academic confidence of secondary school students.

Methodology

The experimental design was employed to collect and analyze the data. The change in academic confidence was studied by using conventional and constructive teaching by applying pre-test and post-test design. Constructivist teaching was taken as an independent variable and academic confidence as dependent variable. The gain scores were calculated and interpreted to test the hypotheses.

Participants

The participants for this study were 200 secondary school students of Jalandhar district of Punjab.

Design

- Students were divided into two groups, one group is control named as A and another is experimental named as B. Both groups contain equal number of boys and girls.
- Both Group A and B comprised of 50 girls and 50 boys.
- A pre-test was conducted with the help of academic confidence scale.
- Group A was taught with traditional method and Group B was taught with Constructive approach.

Tools

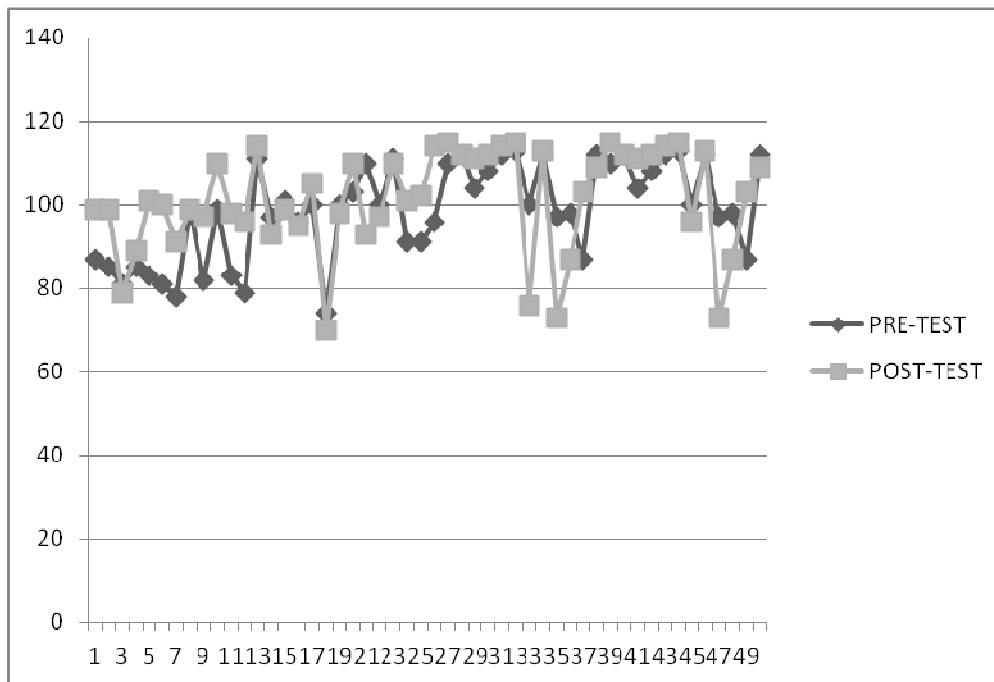
Academic confidence scale constructed by Paul sander and Lalage sanders (2003), University of Wales institute, Cardiff U.K. was used to measure the participants self efficacy. The instrument has a response arrangement of very confident (5) and not at all confidence (1). This scale consists of 24 questions based on 6 factors- studying, understanding, attendance, grades, verbalizing and clarifying.

Results

All the students responded to all the items. There was no missing data. The raw data was collected and tabulated in order to carry out analysis. In order to testify, the data was described statistically. The computed values of mean, standard deviation and t-test of constructive and conventional teaching of Academic confidence among secondary school students for sustainable development have been analyzed as follows:

Descriptive analysis includes mean and standard deviation of calculated score values. The following graphs show the pre-test and post-test values of the control and experimental group of secondary school male students and pre-test and post-test of the conventional and experimental group of Secondary school female students. These graphs (Fig. 1 to 4) have shown that there is a difference in the pre-test and post-test of experimental group due to constructive teaching.

Fig 1. Boys in Control Group



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Fig 2. Boys in experimental group

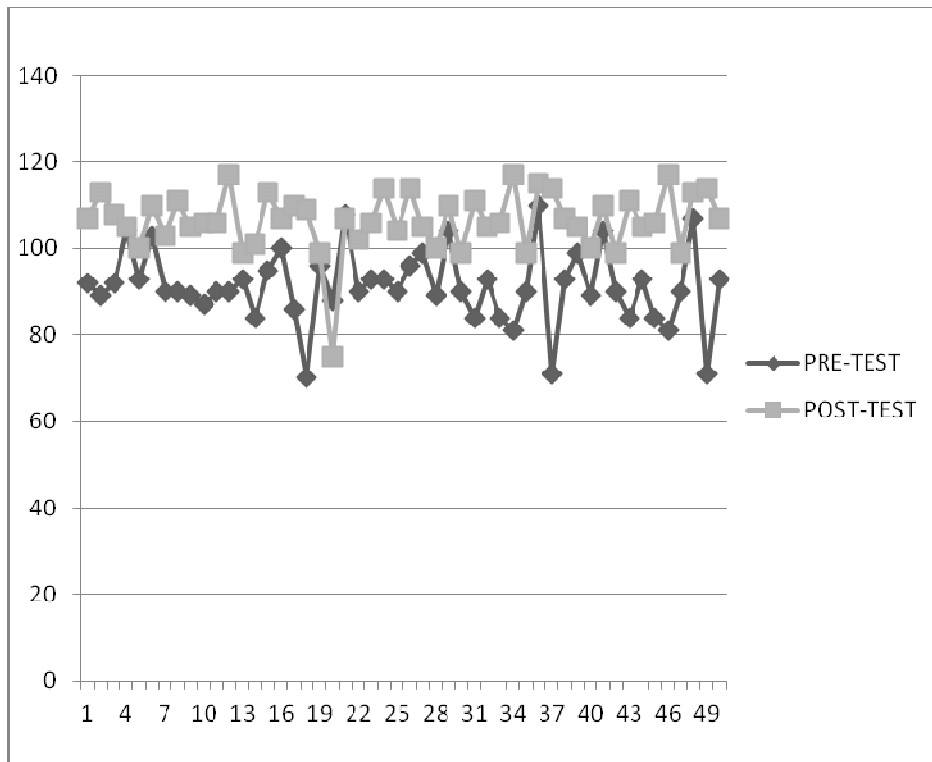


Fig 3. Girls in Control Group

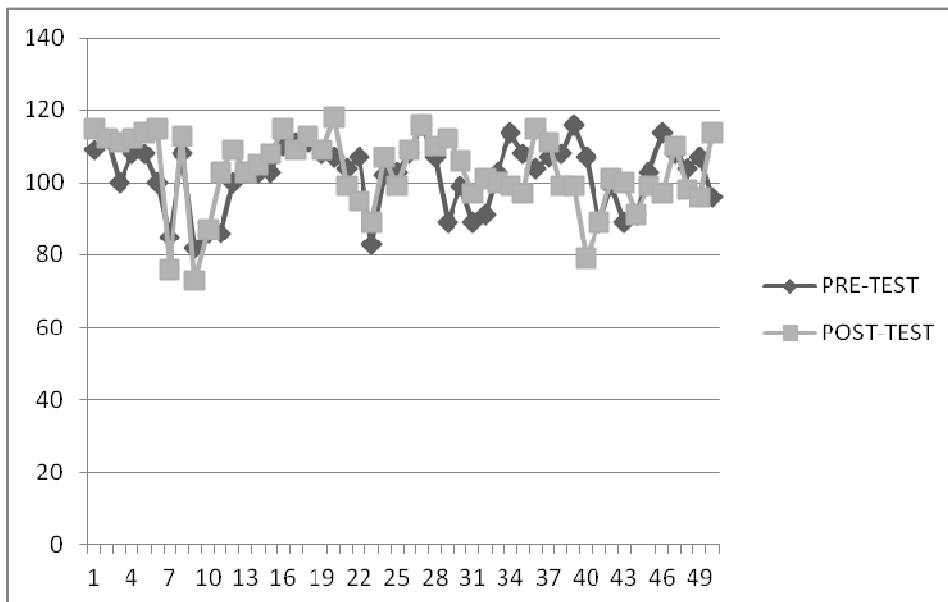
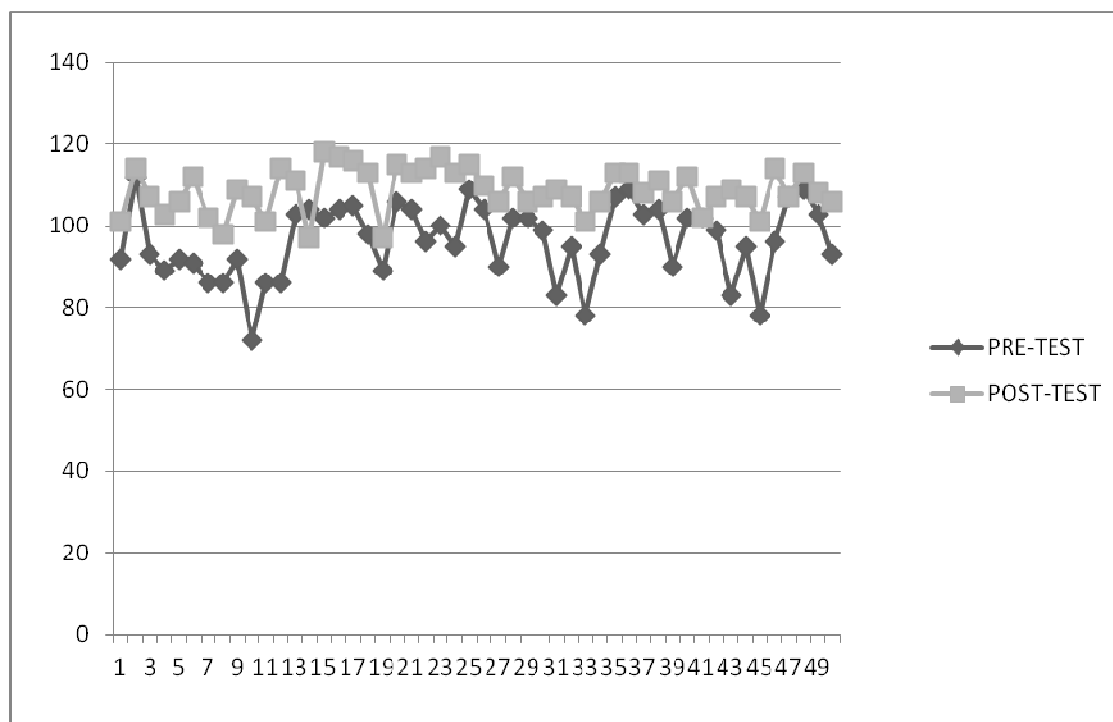


Fig 4. Experimental Girls



The results of the present study threw a valuable light on constructive teaching in secondary schools for sustainable development. Students when exposed to constructive teaching gave better results. The academic confidence was very high among those students from secondary schools who were taught with constructive teaching strategies (Table 1). The effect of constructive teaching on boys and girls separately, found to be non-significant (Table 2).

Table 1: Showing gain scores on Academic confidence of Experimental and Control group

Sr.No	Treatment variable	N	Mean	Standard Deviation	t-ratio
1	Control Group	100	1.75	10.1427	8.4726
2	Experimental Group	100	13.74	9.7666	

Where N refers to the number of students. The observed t- value is more than the table value at 0.01 level. It infers that there is a significant difference in the gain scores of control and experimental group. This shows that there is impact of using constructive approach in teaching.

Table 2. Showing gain scores on Academic confidence of girls and boys

Sr. No.	Gender	N	Mean	Standard Deviation	t- ratio
1	Boys	100	8.87	12.5816	1.367
2	Girl	100	6.62	10.4888	

Where N refers to the number of students. The observed t- value is less than the table value. It infers that there is a no significant difference in the gain scores of girls and boys of the experimental group. This shows that there is no significant difference between the impact of using constructive approach in teaching on girls and boys separately.

Findings

- The statistical analysis shows that the impact of constructive approach is much higher than the traditional method.
- The impact of constructive approach is irrespective of the gender perspective.
- Various Strategies used for constructive teaching showed great motivation amongst students for understanding sustainable development through science subject.

The study will be useful to improve the quality of instructions in the subject of science. The results revealed that teaching through constructive approach is more effective in raising the academic confidence of the students. Students become expert learners in actively constructing knowledge instead of reproducing a series of facts. Thus we can bring about a change through constructivism in learners, in the school, in the society and in the nation at large.

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