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Effectiveness of Constructivist Teaching Strategies using Multimedia on Critical Thinking Skills at Secondary School Level

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Abstract: *This study was explored to examine the effectiveness of constructive teaching strategies in teaching biological science at secondary school level. The sample consisted of 8th class students Tagore memorial High School of Raichur. Data was analyzed by t-test. Findings revealed that the constructivist teaching strategies caused significantly better development of critical thinking skills in biological science concepts for secondary school students than traditional teaching methods.*

Key words: *Constructivist Teaching Strategies, Critical Thinking Skills.*

INTRODUCTION:

The constructivist teaching strategies allow the students to work in groups/individual to participate actively in searching new information then both already known information of students and the new information gained by them are fitted together. This leads to the new knowledge. Constructivism is highly encouraged as a methodology in Indian schools by NCF but despite workshops and encouragement by NCF many teachers are still not sure of how to implement the constructivist teaching strategies. Research by Neo, M. & Neo, T.K. (2009) and many others supported the use of multimedia in constructivist strategies. If multimedia used in constructive teaching strategies it empowers the student to take an active role in own learning.

NEED OF THE STUDY

In India, there are not many studies on the teachers practicing constructivist approach in the classroom and confirming their effectiveness. There are some studies based on 4E approach confirming the effectiveness of constructive approach in India but studies based on 5E approach are very less. There are studies on constructive approach and multimedia separately but to date there are no concrete representations of confirming effectiveness of constructivist teaching strategies based on "5E approach using multimedia in biology in India. Therefore, there is a need to confirm the effectiveness of constructivist approach employing selected appropriate multimedia materials. So this study attempts to find out the effectiveness of constructivist teaching strategies using multimedia for secondary school students in biology.

OBJECTIVE

• To find out the effectiveness of constructive teaching strategies using multimedia on critical thinking skills at secondary school level.

HYPOTHESES

1. There is no mean significant difference between the experimental and control group in the development of critical thinking skills in Biology at pre-test level.
2. There is no mean significant difference between the experiment and control group in the development of critical thinking skills in Biology at post -test level.
3. There is no mean significant difference between the pre-test and post-test in the critical thinking ability of Biology for the experimental group.
4. There is no mean significant difference between the pre-test and post-test in the critical thinking ability of Biology for the control group.

METHODOLOGY

This is an experimental study, consisted of 8th class English medium students of Tagore Memorial Boys High School, Raichur. Mean age of students is 13.5 years. The sampling technique used to select the sample was simple random sampling technique. Sample was selected by using simple random sampling technique. The researcher divided the sample of 50 students into two parallel equated groups through "Raven's Progressive Matrices Test of General Intelligence" and average percentage scores of previous three years scholastic achievement of VIII standard students. One of the groups was assigned to be the control group and the other was the experimental group. Each group had 25 students.

Tools

• Lesson Plans Based on Constructivist Teaching Strategies Of 5E's Model of BSCS; A Multimedia Program for the Teaching Concepts in Biology; Raven's Standardized Progressive Matrices; and Critical Thinking Scale are developed by the investigator.

Research Design

Group	Pre-test	Treatment	Post-test
Experimental	O1	X1	O3
Control	O2	X2	O4

O1 & O2: Pre-test
O3 & O4: Post-test
X1: Teaching based on Constructivist Approach; and
X2: Traditional Teaching.

Procedure of the Study

The study was carried out in 3 phases.

Phase 1: Pre-experimental Stage

At this stage construction and selections of tools was done. First lesson plans based on constructivist 5 E's Model of Biological Science Curriculum Study (BSCS) by employing five "E"s - Engage, Explore, Explain, Elaborate and Evaluate were developed. Two units, structure of the cell and microorganisms from Class VIII were identified and content analysis was done then multimedia material was developed. Then critical thinking test was developed and standardized by researcher.

Phase Two: Implementation Phase

At the beginning, both experimental and control groups were administered with critical thinking test. There is no time limit was given. Then the students of the experimental group were, provided with constructivist teaching strategies using multimedia and control group were taught through traditional method. The researcher observed the treatment. The classes were assigned randomly for the control and experimental groups. The study was conducted classroom instruction of the groups was Five 45-minute sessions per week and carried for four weeks. The two topics covered were Cell and Microorganisms. Content for the two treatment groups was the same; the only difference was the approaches, that is, one was based on the direct instruction approach and the other on the constructivist approach. The traditional method involved the following stages: 1) Statement of Aim, 2) Motivation, 3) general statement, 4) Development stage which includes Teachers Activities, Student,' activities and Blackboard work, 5) Concluding statement, 6) Recapitulation, 7) Evaluation, and 8) Home work: On the other hand, the constructive teaching strategies based on constructivist 5E's Model of Biological Science Curriculum Study using multimedia were developed. In these modules the process is explained by employing five "E"'s. They are: Engage; Explore; Explain; Elaborate; and Evaluate.

Phase Three: Post-Experimental Stage

After the treatment, critical thinking test was administered as post test to both experimental group and control groups.

Analysis of Data

Table 1: Pre-Test on Critical Thinking Ability of the Experimental Group and Control Group

Group	N	Mean	SD	t-value	Remark
Experimental	25	20.22	2.18	0.49	Not Significant
Control	25	19.95	1.96		

From Table-1, the t-value 0.49 is not significant at 0.05 level. Hence the hypothesis-1 is accepted. Thus there is no significant difference between the mean scores of the experimental group and control group in the critical thinking ability at pre-test level.

Table 2: Post-Test on Critical Thinking Ability of the Experimental Group and Control Group

Group	N	Mean	SD	t-value	Remark
Experimental	25	37.51	3.68	15.06	Significant
Control	25	20.00	5.16		

From Table-2, the t-value 15.06 is significant at 0.01 level. Hence it could be inferred that there is a significant deference between the two groups as indicated by the mean value. It can be concluded that the students of the experimental group fared better in the critical thinking ability than the students of the control group. Therefore the hypothesis-2 is rejected.

Table 3: Pre-Test and Post-Test on Critical Thinking Ability of the Experimental Group

Test	N	Mean	SD	t-value	Remark
Pre-test	25	20.21	2.15	20.72	Significant
Post-test	25	37.50	3.68		

From Table-3, the t-value 20.72 is significant at 0.01 level. The mean difference is found to be in favor of the experimental group. The higher mean value in the post test shows that the students of experimental group fared better on the post test than in the pre test. This further shows that the constructivist teaching strategies using multimedia has helped the students to score more in the post-test. Therefore the hypothesis-3 is rejected.

Table 4: Pre-Test and Post-Test on Critical Thinking Ability of the Control Group

Test	N	Mean	SD	t-value	Remark
Pre-test	25	19.94	1.95	0.32	Not Significant
Post-test	25	20.00	5.16		

From Table-4, the t-value 0.32 is not significant at 0.05 level. Hence the hypothesis-4 is rejected. Hence it could be inferred that there is no significant difference between the mean scores of critical thinking test scores of the pre-test and that of post-test for the control group.

Major Findings

1.There is no significant difference between the mean scores

of the pre-test of the experimental group and control group in the development of critical thinking skills by using constructivist teaching strategies using multimedia (t-value: 0.490).

2. There is significant difference between the mean scores of the post-test in the development of critical thinking skills by using constructivist teaching strategies using multimedia of the experimental and control group (t-value: 15.06).

3. There is significant difference between the mean scores of the pre-test and post-test in the experimental group's critical thinking skills by using constructivist teaching strategies using multimedia (t-value: 20.72).

4.There was no significant difference between the mean scores of the pre-test and post-test in critical thinking skills by using constructivist teaching strategies using multimedia (t-value: 0.032).

CONCLUSIONS

• The constructivist teaching strategies using multimedia caused significantly better development of critical thinking skills for the biological concepts for secondary school students. The result show strong support with the study of Jameela, T. (2005).

• Thus this study was able to demonstrate that by incorporating multimedia in constructivist teaching strategies allowed the student successful in developing critical-thinking skills, as suggested by Rodger Bybee in Biological Science Curriculum Study (BSCS). Thus this research has shown that the constructivist teaching strategies using multimedia can be used as efficient strategies in Indian classroom.

EDUCATIONAL IMPLICATIONS

• By adopting the constructive approach, the teacher can modify existing dull and uninteresting method of teaching to a more interesting.

• This will contribute towards research-tested teaching strategies for practicing teachers in any subject area.

• By the use of constructive teaching strategies students develop critical thinking skills, and they get opportunity to explore the things.

• The constructive teaching strategies modify the teachers, where the teachers give more importance to understanding and positive educational relations with the students.

• Constructive teaching strategies using multimedia involves the active involvement of students.

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