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INTERACTIVE EFFECT OF CONSTRUCTIVIST APPROACH TO INSTRUCTION IN MATHEMATICS AND SOCIO-ECONOMIC STATUS OF STUDENTS ON THEIR PROBLEM-SOLVING SKILL

Education subject

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Introduction

Problem solving involves application of thinking and reasoning to various kinds of problems encountered in life. Problem solving is an integral part of developmental activities and provides opportunities for children to practice what they have learned by applying their learning situations. According to the PISA (2012), the economic status of a student's family has an impact on students PSS. It can be said that those students mother/fathers' who are highest occupational status may stem from greater access to opportunities for developing problem-solving skills both in and outside of school compared to those who are not.

Rationale of the Study

Constructivist strategies-based instructional programme could be used for enhancing PSS of the students. Constructivist strategies i.e., concept mapping, BBL, KNWS, co-operative learning and project based learning could include different activities wherein students can share their difficulties with teacher or with peers and resolve their problems. It is expected that SES of a student will interact with the intervention programme and influence PSS of students.

Review of Related Literature

Courant (1991) identified isolate some concepts central to constructivist design, teaching and learning: embed learning in a rich authentic problem-solving environment; provide for authentic versus academic contexts for learning. Anthony (1996) summarizes the implications of constructivism for instructional design of mathematics provide multiple representations of reality, represent the natural complexity of the real world, focus on knowledge construction, not reproduction; support collaborative construction of knowledge through social negotiation. Padmanabhan (2007) in her article on constructivism and reflective teaching in teacher education has tried to focus on constructivism and reflective teaching, their interrelation. The author says that mostly the lessons are planned, without adapting them to fit the needs of the students. The concept of multiple intelligences respects the wonderful range or multiple talents and capacities of all individuals regardless of cultural, intellectual or collaborative learning, constructivism and problem solving and constructivism and instruction. It highlights about the role of constructivist teachers and reflective teaching, levels of reflection, reflective teaching and teacher education in India. Passmore (2011) focused on exploring how students approach difficult problems. It describes results of a teaching experiment with four qualitative characteristics were established: the first step of solution, main information extracted from the problem, generalisation from a problem and completion of solution. From these characteristics the corresponding quantitative indices were introduced and analysed. The structure of two of them, specific SFS and common SHP, are given in detail. Investigation of quantitative indices and their qualitative characteristics gives an opportunity to find out more about interrelations between different stages of the problem-solving process. PISA's (2012) identified, that is the differences in problem solving performance related to parents' occupational status can be decomposed into two components. The first is poorer performance overall: students from lower-status families tend to perform less well in PISA than high-status students, irrespective of the school subject. The second is specific to problem solving. It reflects differences, across groups, in how academic potential translates

into performance in problem solving, as well as differences in the skills uniquely measured by problem solving.

Operational Definitions

Constructivist Approach: Constructivism is a philosophy about learning that proposes learners need to build their own understanding of new ideas.

Socio-Economic Status: It refers to the extent of wealth, power and prestige enjoyed by a student's family.

Problem-Solving Skill: Problem-solving skill means application of thinking and reasoning to various kinds of problems encountered in life. Problem solving is an integral part of developmental activities and provides opportunities for children to practice what they have learned by applying their learning situations.

Statement of the Problem: Interactive Effect of Constructivist Approach to Instruction in Mathematics and Socio-Economic Status of students on their Problem **S**olving **S**kill.

Scope and Delimitations of the Study: In the present study, English medium schools from Greater Mumbai affiliated to the SSC board have been included. It excludes schools with other media of instruction such as Marathi, Hindi, Urdu, Gujarati etc. The present study includes VIII std. students from English medium schools situated in Greater Mumbai. Students from other primary and secondary classes have been excluded. It also excludes schools affiliated to ICSE or CBSE boards. The present research studied the effect of constructivist approach to instruction mathematics and SES on PSS of students. It has excluded other student-background variables from its purview. The study has adopted the quantitative approach rather than the qualitative approach.

Aim of the Study: To ascertain the interactive effect of the intervention programme and socio-economic status of students on their problem solving skills

Objectives of the Study

1. To compare the pre-test scores of problem-solving skills of students from the experimental and control groups.

2. To ascertain the interactive effect of the intervention programme and Socio-Economic Status on Problem-Solving Skill of students.
3. To compute the effect size of the intervention programme and Socio-Economic Status on Problem-Solving Skill of students.

Null Hypotheses of the Study

1. There is no significance difference in the pre-test scores of problem-solving skills of students from the experimental and control groups.
2. There is no significant the interactive effect of the intervention programme and Socio-Economic Status on Problem-Solving Skill of students.

Methodology of the Present Study: The study has adopted the quasi-experimental method. In the present research, the quasi-experimental design of the pre-test post-test, non-equivalent groups' type was used. It can be described as follows:

O_1 **X** O_2 O_3 **C** O_4

Where, O_1 and O_3: Pre-test Scores

O_2 and O_4: Post-test Scores

X : Experimental Group

C : Control Group

Factorial Design: The researcher was used the factorial design to study the interactive effect of the treatment and SES of the students on the PSS towards mathematics. The researcher was first administered the pre-test to both, the experimental and control groups. After the pre-test, the experimental group was taught using the interactive effect of the treatment of constructivist approach and control group was taught using traditional method. The duration of the intervention programme was 38 hours in the experimental group. At the end of the programme post-test was administered on the students of both the groups.

Sample of the Study: In the present study, the sample has been selected consisting of one intact

class each of std. VIII from two different schools situated in the Greater Mumbai. The experimental and the control groups included 48 and 52 students respectively.

Tool of the Study: In the present study, the following tools were used by the researcher to collect data:

1. PSS scale adopted by Murthy (2002)
2. SES by Patel (1997)

Intervention Programme: The duration of the intervention programme is 38 hours. The control group was taught using the traditional method. And experimental group was taught by using intervention programme, which was using different strategies such as concept mapping, BBL, KNWS, co-operative learning and project based learning.

Techniques of Data Analysis: The present research has used statistical techniques of t-test, ANOVA and Wolf's formula.

Null Hypothesis 1: There is no significance difference in the pre-test scores of Problem-Solving Skill of students from the experimental and control groups.

Table 1: PRE-TEST SCORE OF PSS OF EG AND CG

Group	Sample Size	Mean	SD	T	P (two tailed)
EG	48	63.79	6.73	3.03	0.003
CG	52	59.01	8.79		

The preceding table shows that, there is a significant difference between the pre-test scores of PSS of the experimental and control groups. Hence the null hypothesis is rejected. The mean pre-test PSS of students from EG is significantly greater than that of the CG.

Since the experimental and control groups were not selected randomly and since the two groups were not found equivalent on the pre-test, the residual PSS were computed using Dyer's Regression Residuals Method through regression equation of post-test PSS scores on pre-test equation scores of students. The residual scores thus obtained represent scores from which the

effect of pre-test scores of PSS has been removed statistically. These residual PSS are used for the testing of the next hypothesis.

Null Hypothesis 2: There is no significant interactive effect of the intervention programme and Socio-Economic Status on the residual Problem-Solving Skills scores of students.

This hypothesis was tested using two-way ANOVA in which the pre-test scores of students on residual PSS are controlled. The following table shows the relevant statistics of residual PSS of students by treatment and SES.

Table 1: Relevant statistics for ANOVA

Levels of SES / Group	Low SES	Average SES	High SES	Total
	N	**N**	**N**	**N**
CG	12	31	9	52
EG	13	18	17	48
	25	49	26	100
	Mean	**Mean**	**Mean**	**Mean**
CG	-4.00	-1.57	-4.45	-2.63
EG	3.003	0.50	5.21	2.85
Total	-0.36	-0.80	1.86	0

The following table shows the ANOVA of residuals scores of PSS of students by intervention programme and SES after partial ling out the effect of the pre-test PSS of students.

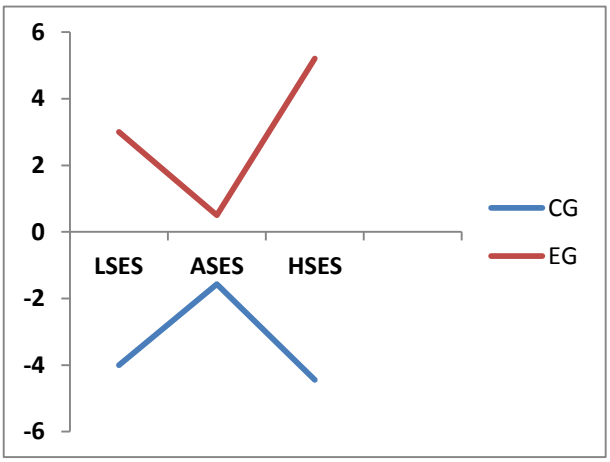
Table 2: ANOVA for PSS of students by treatment (T) and SES

Source	SS	df	MS	F	P
Rows	751.08	1	751.08	4.97	0.0282
Column	125.84	2	62.92	0.42	0.6583
Interaction	156.1	2	78.05	0.52	0.5962
Error	14197.29	94	151.04		
Total	15230.31	99			

The preceding table shows that (a) the F-ratio for rows i.e. intervention programme is significant at 0.0282. Hence it may be concluded that the Mean residual PSS of the experimental group is significantly greater than that of the control group. (b) The F-ratio for columns i.e. SES is not significant at 0.05 level. Hence it may be concluded that the Mean residual PSS does not differ significantly on the basis of SES of students. (c) The F-ratio for interaction effect of

intervention programme and SES is not significant at 0.05 level. Hence it may be concluded that the mean residual PSS of students do not differ on the basis of the interaction between intervention programme and SES of students.

The following figure shows the differences in the mean residual PSS of students on the basis of treatment and SES of students.



The effect size of the independent variables was computed using Wolf's formula and was found to be 0.44 (small) for the intervention programme.

Conclusion: It may be concluded that the mean residual PSS of students of the EG is significantly greater than that of the CG. Thus, the constructivist strategies-based instructional programme was found to be effective in enhancing PSS of students with high, average and low SES. However, its effect size is found to be low in magnitude. The SES of the students was not found to influence the PSS of students.

Discussion: The treatment i.e. the intervention programme developed by the researcher is found to be effective for enhancing PSS of students. The literature review indicated that roles the teachers play in the enhancing PSS are paramount in student success in terms of pupils taking right decisions and convert the problem in to systematic and sequential steps. Afterwards the child needs to effectively communicate the process of solving the problem. This study could

serve as a contribution to educational research that will help to enrich the teaching and learning practices with the help of constructivist strategies based instruction that may increase the PSS of students with different levels of SES backgrounds.

Moreover, with concerns among educational practitioners in general about the gaps in PSS among control groups, this study has shed light on different constructivist strategies for participating students that can be utilized readily in an effort to increase the PSS of students for different socio-economic groups and ultimately contribute to teaching practices that could facilitate PSS of students. In sum, the results of this study could provide a framework for educators to implement best practices that will lead to increasing PSS of students and help to close the education gap that persists.

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