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Whether Students' Academic Achievement in CT and TBCT Classroom is Influenced by Their Level of Gender and IQ and There Interaction: 2 x 2 Factorial Design

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ABSTRACT

The main objective this study is to examine the main effect of Gender and IQ and their interaction on academic achievement of students in History and Geography units of IX Standard Social Science subject taught using Constructivist Teaching (CT) and Technology Based Constructivist Teaching (TBCT). The study used two equivalent group design. A sample of 80 students studying in IX standard of one of the government school of Bangalore city took part in the study. Sample was equated into two equal number of students for Experimental Group-1 and Experimental Group-2 and each group consisted of 40 students. Validated CT and TBCT modules were used to taught Experimental Group-1 and Experimental Group-2 respectively. At the end of each unit, unit-test in History and Geography was administered. The data was analyzed using 2x2 factorial design. The main finding of the study are Gender by IQ interaction is found only in case of academic achievement of students in Geography taught using TBCT in Experimental Group-2; there was no combined interaction effect on academic achievement of students in History subject taught using CT and TBCT in Experimental Group-1 and Experimental Group-2; and there was no interaction effect on academic achievement of students in Geography taught using CT in Experimental Group-1.

Key Words: Constructivist Teaching (CT), Technology Based Constructivist Teaching (TBCT), Academic Achievement

INTRODUCTION

There are many means by which teacher can impart effective instruction in class. Now a days Constructivism and Technology are emerging approaches in education. In constructivist education teacher engage students in knowledge construction. It encourages wide range of experiences such as inquiry activities like discovery, problem solving, discussion with peers and teachers, collecting and interpreting information from the different sources, experiencing their understanding in divers ways, applying and validating their understanding in a new way etc (Sharma, 2006). Overall, it focuses on constructing knowledge by student instead of receiving knowledge from teacher in class. In this way, constructivism brought revolutionary change in education shifting teacher centered education into learner centered education. The present education scenario is incomplete in the absence of technology usage. Particularly computer technology and information technology greatly influence and shaped different faces of education. Today technology is not only used for transfer of knowledge even for knowledge construction. In this connection Sharad, (2006) rightly claimed that "the role of technology in education so important that it will force the issue of didactic versus constructing teaching. The teacher will no longer have the choice but



will compel to use a constructivist approach in technology rich environment”. Even there is massive scope for engaging students in knowledge construction using technology components like audio, visual, audiovisual, multimedia and PPT. Integration technology brings new innovative practice and makes every teacher to relook into his roles in shifting tradition classroom to technology based constructivist class. Thus, there is greater scope and crucial need of integration of technology tools in constructivism. In this background the researcher conducted a study to find out the effect Constructivist Teaching and Technology Based Constructivist Teaching on academic achievement. In this research article researcher examined and reported findings of the main effect of level of Gender and IQ and their interaction on academic achievement of student in History and Geography subject in Constructivist Teaching and Technology Based Constructivist Teaching.

REVIEW OF RELATED LITERATURE

Ramanath and Sivakumar (2011) conducted a study on “Constructivism based learning strategy in enhancing the science process skills of the students of secondary schooling”. The study found that constructivism based learning strategy enhances the science process skill among the secondary school learners. Gender has no influence in enhancing science process skills through constructivism base learning approach. Raval (2012) conducted a study on “Effectiveness of constructivist approach to the teaching of animal classification in science and technology of standard ninth”. Study revealed that there was no significant difference in posttest mean of students taught through traditional teaching approach and CIP. Post-test scores of boys and girls of CIP Group was higher than the boys and girls of control Group. Ramulu (2015) researched “Enhancement of student learning in Biology using constructivism” and found that: there was a significant difference between the quiz scores of constructivist Group and control Group and constructivist Group performed better compare to traditional Group in quiz scores. Constructivist Group performed higher in attitude inventory over their counterpart control Group. Studies are also conducted separately in Technology. Jyothi (2007) studied “Impact of computer-based learning on students of Chemistry”. The study revealed that the Experimental Group performance was far superior to the control Group. Devanathan (2008) conducted a study on “Opinion of school teachers at secondary level with regard to the level of integration of technology”. The findings of the study were there was no significant difference in male and female, science and social science teacher and UG and PG teachers’ opinion about level of integration of technology. Few studies are also conducted related to technology related constructivist teaching. They are; Pear and Crone-Todd (2002) conducted a study on “A social constructivist approach to computer-mediated instruction”. The study found that CAPSI has created student control course material and engaged in knowledge construction. CAPSI was highly useful in systematic way of implementing the course materials. Costa, Chaudhari and Nunes (2011) carried out a study on “the attitude that B.Ed. trainee teachers towards constructivist online learning”. The study revealed that 92% of participants reported web based learning easy to use, 82.35% participants expressed that web based learning is not very time consuming. There was not a very definite opinion as to whether web based learning was less interactive than face to face learning. From these review of related literature it was observed that studies were conducted in constructivism, technology and few studies also in technology related constructivist teaching. But researcher did not find any studies related to technology based constructivist teaching in social science subject. Thus, the study was conducted. In the preset study researcher examined the main effect of level of Gender and IQ and their interaction on

academic achievement of student in History and Geography subject in Constructivist Teaching and Technology Based Constructivist Teaching.

KEY TERMS

Constructivist Teaching (CT)

Constructivist Teaching refers to a process in which learning environment is created by the teacher to engage students in knowledge construction based on prior knowledge in the Group, wherein peer interacts with one another with the help of the materials provided by the teacher and construct new ideas and concepts. Constructivist Teaching modules are created by integrating 5 E's Instructional Model, Jigsaw cooperative learning strategy, Constructivist Evaluation, ZPD and Scaffolding.

Technology Based Constructivist Teaching (TBCT)

It refers to an approach in which the researcher integrates components of technology in constructivist teaching. TBCT modules were developed using 5 E's Instructional module, Jigsaw, technology components, Constructivist Evaluation, ZPD and Scaffolding. TPACK (Technological Pedagogical Content Knowledge) approach was used to develop TBCT module.

Academic Achievement:

It refers to the achievement of students in selected topics of Social Science namely History and Geography subject.

VARIABLES OF THE STUDY

In the present study Constructivist Teaching and Technology Based Constructivist Teaching (TBCT) were considered as independent variables, whereas academic achievement was considered as dependent variable. Gender and IQ were treated as moderate variables. The study aimed to find out the main effect of Gender and IQ, and their interaction on academic achievement of students in Constructivist Teaching and Technology Based Constructivist Teaching.

OBJECTIVES

1. To study the main effect of level of Gender and IQ and their combined interaction effect on academic achievement of student in History & Geography subject taught using CT with respect to Experimental Group-1.
2. To study the main effect of level of Gender and IQ and their combined interaction effect on academic achievement of student in History & Geography subject taught using TBCT with respect to Experimental Group-2.

HYPOTHESES

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1. There is no significant main effect of level of gender (boys and girls) and Level of IQ (high and low IQ) and their interaction on Academic Achievement of students in History subject taught using CT with respect of Experimental Group-1.
2. There is no significant main effect of level of gender (boys and girls) and Level of IQ (high and low IQ) and their interaction on Academic Achievement of students in Geography subject taught using CT with respect of Experimental Group-1.
3. There is no significant main effect of level of gender (boys and girls) and Level of IQ (high and low IQ) and their interaction on Academic Achievement of students in History subject taught using TBCT with respect of Experimental Group-2.
4. There is no significant main effect of level of gender (boys and girls) and Level of IQ (high and low IQ) and their interaction on Academic Achievement of students in Geography subject taught using TBCT with respect of Experimental Group-2.

METHOD

The study used two equivalent Group design. The main feature of this Experimental design is, both the groups are parallel. Mid-term exam scores of IX students in Social Science subject was used to equalize two groups with the help of normality test. Further, groups were randomly named it as Experimental Group-1 and Experimental Group-2, and assigned with Constructivist Teaching and Technology Based Constructivist Teaching respectively.

SAMPLE OF THE STUDY

The study used purposive sampling technique. A sample of 80 students studying in IX standard of one of the government school of Bangalore city took part in the study. Based on nature of above mentioned two equivalent group design, sample was equated into two equal numbers of students for Experimental Group-1 and Experimental Group-2 and each group consist of 40 students.

EXPERIMENTAL PROCEDURE

The researcher developed CT and TBCT module for History (Bhakti Panth) and Geography (Industries of Karnataka) units of IX standard social science subject. These modules were validated with help of guide, subject experts, experts in constructivism and experts in the field of technology. Few lessons were tried out in other than the Experimental school. Finally, Experimental Group-1 was taught using CT module and Experimental Group-2 was taught using TBCT module. At the end of teaching of each unit Unit-test was administered to collect data about academic achievement of students in History and Geography.

TOOLS USED IN THE STUDY

The researcher has used the tools namely Ravens Progressive Matrices developed by Raven to test the IQ of student; Unit Test in History and Geography constructed and validated by researcher with the help of guide, subject experts and methodology professors of B.Ed. college.

STATISTICAL TECHNIQUES USED



In the current study 2 X 2 Factorial design was used to examine the main effect of two moderate variables namely gender (Boys and Girls) and IQ (High & Low IQ) on academic achievement and their combined interaction on academic achievement.

DATA ANALYSIS AND INTERPRETATION

Hypothesis-1: There is no significant main effect of level of gender (boys and girls) and Level of IQ (high and low IQ) and their interaction on Academic Achievement of students in History subject taught using CT with respect of Experimental Group-1.

Table 1: Summary of Results of Two-Way ANOVA for Academic Achievement of Students in History of Boys and Girls and High and Low IQ Students of CT Group.

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Gender	3.540	1	3.540	.225	.638
IQ	154.862	1	154.862	9.827	.003
Gender * IQ	46.388	1	46.388	2.944	.095

Table-1 reveals that obtained p value for main effect of gender is higher than the .05 level of significance. This indicate that there is no significant main effect of gender on academic achievement of students between boys and girls at .05 level of significance, $F(1, 36) = .225$, $p = .638$. Whereas obtained p value for main effect of IQ is less than .05 level of significance. It means, there is significant main effect of IQ on academic achievement of students between high and low IQ students at .05 level of significance, $F(1, 36) = 9.827$, $p = .003$. The obtained p for interaction effect gender by IQ on academic achievement is higher than .05 level of significance. So the interaction effect of gender by IQ on academic achievement of student in History taught using CT is not significant at .05 level of significance, $F(1, 36) = 2.944$, $p = .095$.

Hypothesis-2: There is no significant main effect of level of gender (boys and girls) and Level of IQ (high and low IQ) and their interaction on Academic Achievement of Students in Geography subject taught using CT with respect of Experimental Group-1.

Table 2: Summary of Results of Two-Way ANOVA for Academic Achievement of Students in Geography of Boys and Girls and High and Low IQ Students of CT Group.

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Gender	.746	1	.746	.036	.851
IQ	78.161	1	78.161	3.771	.060
Gender * IQ	48.280	1	48.280	2.329	.136

Table-2 reveals that obtained p value for main effect of gender is higher than the .05 level of significance. This indicate that there is no significant main effect of gender on academic achievement of students between boys and girls at .05 level of significance, $F(1, 36) = .036$, $p = .851$. Whereas obtained p value for main effect of IQ is higher than .05 level of significance. It means, there is no significant main effect of IQ on academic achievement of students between high and low IQ students at .05 level of significance, $F(1, 36) = 3.771$, $p = .060$. The obtained p for interaction effect gender by IQ on academic achievement is higher than .05 level of significance, So the interaction effect of gender by IQ on academic

achievement of student in Geography taught using CT is not significant at .05 level of significance, $F(1, 36) = 2.329, p = .136$.

Hypothesis-3: There is no significant main effect of level of gender (boys and girls) and Level of IQ (high and low IQ) and their interaction on Academic Achievement of students in History subject taught using TBCT with respect of Experimental Group-2.

Table 3: Summary of Results of Two-Way ANOVA for Academic Achievement of Students in History of Boys and Girls and High and Low IQ Students of TBCT Group.

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Gender	68.267	1	68.267	5.741	.022
IQ	33.917	1	33.917	2.852	.100
Gender * IQ	2.769	1	2.769	.233	.632

Table-3 reveals that obtained p value for main effect of gender is less than the .05 level of significance. This indicates that there is a significant main effect of gender on academic achievement of students between boys and girls at .05 level of significance, $F(1, 36) = 5.741, p = .022$. Whereas obtained p value for main effect of IQ is higher than .05 level of significance. It means, there is no significant main effect of IQ on academic achievement of students between high and low IQ students at .05 level of significance, $F(1, 36) = 2.852, p = .100$. The obtained p for interaction effect gender by IQ on academic achievement is higher than .05 level of significance, So the interaction effect of gender by IQ on academic achievement of student in History taught using TBCT is not significant at .05 level of significance, $F(1, 36) = .233, p = .632$.

Hypothesis-4: There is no significant main effect of level of gender (boys and girls) and Level of IQ (high and low IQ) and their interaction on Academic Achievement of students in Geography subject taught by TBCT with respect of Experimental Group-2.

Table 4: Summary of Results of Two-Way ANOVA for Academic Achievement of Students in Geography of Boys and Girls and High and Low IQ Students of TBCT Group.

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Gender	3.267	1	3.267	.290	.594
IQ	.645	1	.645	.057	.812
Gender * IQ	56.929	1	56.929	5.047	.031

Table-4 reveals that obtained p value for main effect of gender is higher than the .05 level of significance. This indicates that there is no significant main effect of gender on academic achievement of students between boys and girls at .05 level of significance, $F(1, 36) = .290, p = .594$. Whereas obtained p value for main effect of IQ is higher than .05 level of significance. It means, there is no significant main effect of IQ on academic achievement of students between high and low IQ students at .05 level of significance, $F(1, 36) = .057, p = .812$. The obtained p for interaction effect gender by IQ on academic achievement is less than .05 level of significance, So the interaction effect of gender by IQ on academic achievement of student in Geography taught using TBCT is significant at .05 level of significance, $F(1, 36) = 5.047, p = .031$.

FINDINGS

The main findings of the study drawn from Two-Way ANOVA are; The academic achievement of student in History taught using CT in Experimental Group-1 showed that the main effect of gender on academic achievement is not significant, the main effect of IQ is significant between High and Low IQ and the interaction effect of Gender by IQ is also not significant. The academic achievement of student in Geography taught using CT in Experimental Group-1 disclosed that the main effect of gender and IQ, and their interaction is also not significant. With respect to academic achievement of students in History taught using TBCT in Experimental Group-2 showed that there is significant main effect of gender, no main effect of IQ and interaction of both variables on academic achievement. The academic achievement of students in Geography taught using TBCT in Experimental Group-2 disclosed there is no main effect of gender and IQ and their interaction effect is significant.

CONCLUSION

Based on the finding of the present study it can be concluded that Gender by IQ interaction is found only in case of academic achievement of students in Geography taught using TBCT in Experimental Group-2. Whereas in the same group main effect of gender and IQ is not significant. It indicates that gender and IQ individually not influenced on the academic achievement but combined together influenced on achievement of students. The study also reveals that academic achievement of students in History and Geography not influenced by gender taught using CT in Experimental Group-1. Whereas gender influence observed in academic achievement of student in History taught using TBCT in Experimental Group-2. With respect main effect of IQ found in academic achievement of students in History taught using CT in Experimental Group-1. Whereas there is no main effect of IQ on academic achievement in History and Geography taught using TBCT and CT in Experimental Group-2 and Experimental Group-1 respectively.

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