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The Effectiveness Of Constructivist Pedagogy On Mathematical Anxiety On The Students Of High I.Q.

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Abstract

The students of the seventh class of the U.P. board living in Lucknow city were the population and all the 47 students of the seventh class of 'Upper Primary School Mukarimnagar' were the sample of the presented research. Purposive sampling was used to select the sample and out of 47 students in the class, 40 students were selected through a lottery system and matched on the basis of I.Q. Out of the 20 students in the experimental group, 11 students of high I.Q. and out of the 20 students existed in the control group, 10 students of high I.Q. existed in the experiment. Through 'Non-Equivalent Post-Test-Only Control Group design' the researcher taught all 11 students of the experimental group of high I.Q. using self-made constructivist pedagogy-based instructional material (teaching modules) and all the 10 students of the control group of high I.Q. were taught from the pre-determined unit of the class seventh math's textbook through traditional teaching method using chalk and talk procedure till one and half months in every working day in the school. After this in the post-test, the data was collected on the mathematical anxiety of the students using a self-developed and standardized

'Mathematical Anxiety Scale'. The normality of the experimental group of high I.Q. was found 0.082 and the control group was found 0.838. The homogeneity between both groups was found 0.265. The mean of the scores obtained on the scale of the experimental group students was 102.55 and the mean of the control group students was 131.20. The t-value between both groups was found 12.34 with at 0.01 level of significance. The research explored that the mathematical anxiety of the students of the experimental group of high I.Q. was found 52.33% and the control group was found 67.0%. The experimental group students of high I.Q. have 'average mathematical anxiety' and the students of the control group of high I.Q. have 'high mathematical anxiety'.

Keywords: Constructivist Pedagogy,
Mathematical Anxiety, Traditional teaching.

Introduction

Students use their physical and mental abilities to achieve learning with the help of their senses. They create knowledge by receiving the sensations presented in the environment through their sense organs. This process continues for a lifetime. Even the child has gained sufficient knowledge of his level at his pre-school stage which is quite normal and helpful to gain formal education. Similarly, upon becoming an adult the formal education received by a man during his education period, is helpful in increasing his general knowledge of world life and proves useful in daily work. But any human being is not acquiring the same education and common qualities from the same school and same teachers. Because each person has a different ability to build self-knowledge, which affects his whole life, it is known as the constructivist approach. Educationists thought to make education accessible, it must be student-centered and to make education student-centered it is necessary to use the constructivist approach in education. Therefore, NCF-2005, NCFTE-

2009 and NEP-2020 emphasized the implementation of the constructivist approach in teaching-learning. It focuses that students can construct their own knowledge according to their prior knowledge and past experiences. So that each student can learn according to their learning ability, this is known as constructivist pedagogy. It is used in various subjects like Geography, Biology, Science, Mathematics, English, etc. to understand various concepts in an easy way.

Research Question

What are the consequences of constructivist pedagogy on the mathematical anxiety of the high I.Q. students?

Objective of the Study

To compare the effect of constructivist pedagogy on mathematical anxiety among high I.Q students of the seventh class.

The Hypothesis of the Study

There was no significant difference in the mathematical anxiety between the experimental group and the control group students of high I.Q.

Delimitations

1. The research work is restricted to all Upper Primary Schools of Basic Shiksha Parishad U.P. existing in the Lucknow district.
2. The research work is restricted to Seventh class students.
3. The research work is restricted to the U.P. Board.
4. The research work is restricted only to mathematics subjects.
5. The research work is restricted to selected topics of mathematics subject.

Reviews of related literature

R. Nagalakshmi (2011) found that the constructivist approach enhanced learning with understanding properly. It made easy to a typical concept or fact.

Due to the use of the constructivist approach, the students' achievements in science, science process skills, science-related attitude, observation, and the perception of the nature of science were increased at the high school level. **R. Ramanath (2013)** explored in his research that by using the 'Constructivist Based Learning Strategy' (CBLS) the students learned the concept easily and had more interest in learning. The girls' students gain more achievement through CBLS. **Ravula Krishnaiah (2013)** investigated that the constructivist approach was more effective on male teachers in comparison to female teachers. It was found to be more effective for high school teachers than intermediate college teachers. **Ganiger Bharti (2014)** explored in the research that the constructivist approach was proved very effective for the professional development of pre-service teachers.

By reviewing the research based on the constructivist approach, it was revealed that the constructivist approach was proved very effective in enhancing teaching-learning at the school-level education. It was very useful to understand typical concepts of various subjects like Mathematics, Science Geography, Biology, etc., because the constructivist approach provided a self-learning platform to the students in which the students learn according to their intelligence, practicality, and creativity. It is very effective for girls' students.

P.S. Parmar (1993) Investigated that student who has high intelligence scored better in Mathematics than students who have low intelligence. To mathematical achievement the learning of mathematical concepts contributed 42%, Intelligence contributed 43.06%, while cast, anxiety and gender did not contribute to mathematical achievements. **Satya Prakash (2000)** explored that when mathematical achievement and mathematical creativity developed then the problem-solving ability related to socio-demographic variables and anxiety was also developed in primary school students. The school environment was very important to the

development of problem-solving ability and mathematical creativity in the dimensions of fluency, flexibility, and originality.

By reviewing the literature, it was revealed that the contribution of learning mathematical concepts was 42% and student intelligence was 43.06% contributed to gaining mathematical achievements, while caste, anxiety, and gender did not contribute to it. The school environment was very important to the development of problem-solving abilities related to anxiety and socio-demographic variables were also developed.

Significance of the Study

All students believe that mathematics is a typical subject, some students consider math very difficult and some students consider math a little less difficult, whether their I.Q. is high or low. It is understood that there is some concern among all the students regarding Mathematics subject that how they will perform in mathematics subject. The reviews of the related literature reveal that the students who have high I.Q. obtained high mathematical achievements and the students who have low I.Q. obtained low mathematical achievements. The students who have high I.Q. understand mathematics quickly, but still they have Mathematical anxiety. The constructivist approach is used to enhance the learning of the students and to simplify their concepts so that they can understand the concepts easily. Students understand the concept closely through activities. They can learn at the same pace as their ability according to their understanding. By Understanding any concept deeply through activities, the scope of forgetting that concept becomes less and learning becomes more stable. So, the researcher wants to know whether the mathematical anxiety of the students of high I.Q. will be reduced or increased by using constructivist pedagogy in teaching-learning.

Research method

The experimental method was used to conduct the study.

Research Design

To conduct the research used the 'Non-equivalent post-test only control group design'.

Population

The class seventh students of the U.P. board belonged to Lucknow city were the population of the study.

Sample

The sample of the study was the class seventh students of the U.P. board of the 'Upper Primary School Mukarimnagar' Lucknow.

Variables of the study

The 'constructivist pedagogy' and 'traditional teaching method' were the independent variables and 'mathematical anxiety' was the dependent variable of the study.

Tools of the study

1. The self-developed constructivist pedagogy-based instructional material (teaching modules).
2. The self-developed and standardized 'Mathematical Anxiety Scale'.
3. The pre-determined content of unit 3 'Exponent and Power' from the class seventh mathematics textbook of U.P. board.
4. The 'Group Test of General Mental Ability (Hindi modified-72) by Dr. Shyam Swaroop Jalota.

Formation of Experimental and Control Groups

- **Random selection**

The 40 students of the class seventh were selected out of the 47 students through a lottery system of random sampling.

- **Random Assignment**

To test the I.Q. of the students the general mental ability test (Hindi modified-72) was applied to the selected students and divided them into experimental and control groups. The 110.27 I.Q. and

is above considered the high I.Q. and the below 110.27 I.Q. is considered the low I.Q. Thus, in the experimental group, the 11 students have high I.Q. and in the control group, the 11 students have high I.Q. The data obtained from low I.Q. students would not be counted in the statistical analysis.

Experiment

The experiment was conducted for up to one and a half months. The 11 students with high IQ in the experiment group and the 11 students with high I.Q. in the control group were taught by the researcher for the duration of the 40-minute period alternatively. The experiment was taught through the self-developed constructivist pedagogy-based instructional material (teaching modules) and the control group was taught through the conventional teaching method. After this, the researcher applied the 'Mathematical Anxiety Scale' to the experiment and the control group of students and the scores were collected in the form of data.

Analysis

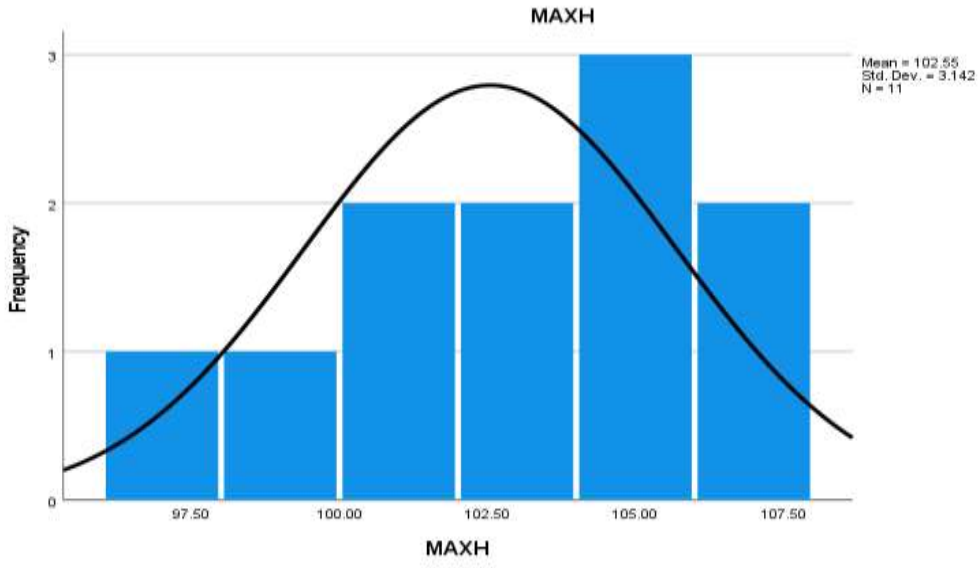
The Kolmogorov-Smirnov and Shapiro-Wilk test was used to test the normality of the two independent samples. The effect of the constructivist pedagogy was tested on the mathematical anxiety of the high I.Q. students.

Normality-Test							
		Kolmogorov-Smirnov[a]			**Shapiro-Wilk**		
	I.Q.	**Statistic**	**df**	**Sig.**	**Statistic**	**Df**	**Sig.**
MA POST	**High-C**	.209	10	.200*	.863	10	.082
	High-X	.146	11	.200*	.966	11	.838
*. This is a lower bound of the true significance.							
a. Lilliefors Significance Correction							

Table 1: Normality test of mathematical anxiety between both groups

The p-values 0.082 and 0.838 were found from the test of normality, it was greater than the prescribed table value of 0.05 (table-1). It was indicated that the distribution of mathematical anxiety in both groups was normal (bell-shaped). (Fig:1)

NPC with Histogram Plot of The Raw Scores of Mathematical Anxiety of Experimental Group of High I.Q.



NPC with Histogram Plot of The Raw Scores of Mathematical Anxiety of Control Group of High I.Q.

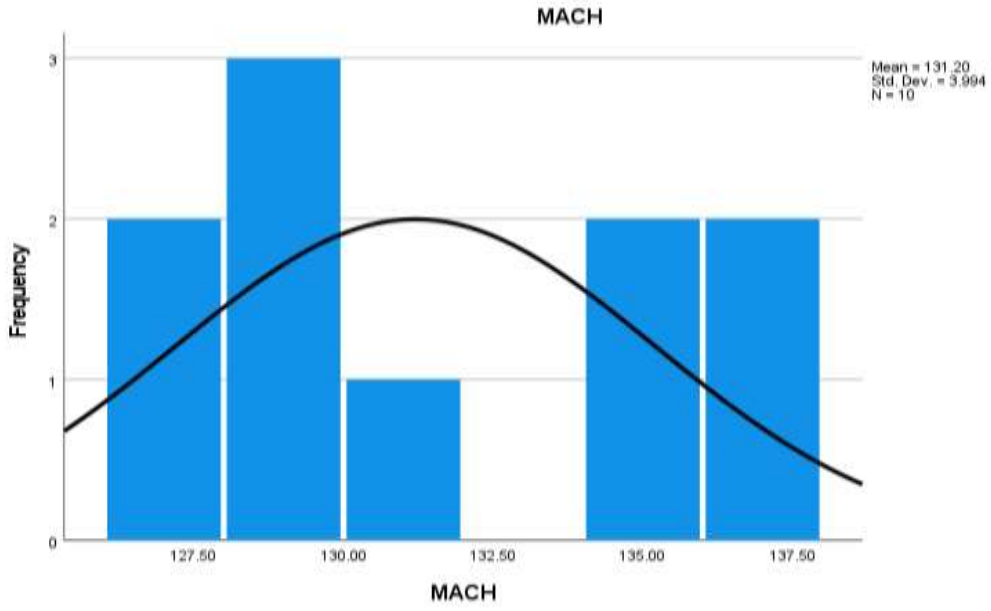


Fig. 1: NPC with Histogram of mathematical anxiety between Experimental and Control Groups of high I.Q.

Test of Homogeneity of Variance

		Levene Statistic	df1	df2	Sig.
MA POST	Based on Mean	1.424	1	19	.248
	Based on Median	.994	1	19	.331
	Based on Median and with adjusted df	.994	1	18.179	.332
	Based on trimmed mean	1.319	1	19	.265

Table 2: Levene's test of mathematical anxiety between both groups

Levene's test was used to test the homogeneity of the experimental and the control groups. The test value was found 0.265 (table-2), which was greater than the prescribed value of 0.05. It was shown that the experimental group of students and the control group of students were homogeneous on the basis of mathematical anxiety.

Two-Tailed Significance t-test between the Experimental Group and the Control Group of High I.Q. on Mathematical Anxiety

Group	Mean	SD	N	df	t-value	Significance
Experimental Group of High I.Q. based on Mathematical Anxiety	102.55	3.142	11	19	12.34	Significant t > 2.09 at 0.05 level t > 2.86 at 0.01 level
Control Group of High I.Q. based on Mathematical Anxiety	131.20	3.994	10			

Table 3: t-test of mathematical anxiety between the students of both groups

The t-value was found 12.34 which was greater than the t-table value of 2.86 at df 19 and 0.01 level of significance (table-3). It was clarified that the students of the experimental group had low

mathematical anxiety and the control group of students had high mathematical anxiety. The mean of the mathematical anxiety scores of the experimental group was found 102.55. So, the students of the group have 52.33% mathematical anxiety and according to the norms of the 'mathematical anxiety scale' they were shown 'average mathematical anxiety'. The mean of the mathematical anxiety scores of the control group was found 131.20. So, the students of the group have 67.0% mathematical anxiety and according to the norms of the 'mathematical anxiety scale' they were shown 'high mathematical anxiety'.

Findings

The t-value between these two groups was found 12.34, Which was significant at the 0.01 level of significance and the table value was 2.86 at df 19. According to the result, the experimental group of students had 52.33% mathematical anxiety which was lower than the 67.0% mathematical anxiety of the other group. As per the norms of the 'mathematical anxiety scale,' the students of the experimental group with high I.Q. have 'average mathematical anxiety' and the control group students have 'high mathematical anxiety'. Both groups were matched on the basis of I.Q. So, they suffered from the same mathematical anxiety because the mathematical anxiety across both groups was normal and homogeneous. Therefore, due to the treatment given to the students of the experimental group the mathematical anxiety of the students became low.

Interpretation

In the experiment, every group was taught by the researcher at the 40-minute time duration which was 40 minutes in every working day. The experimental group was taught through constructivist pedagogy-based instructional material (teaching modules). In which the students were taught through learning by doing. The students performed various activities which were needed to learn the mathematical

concepts. In this method, the students learned the concept through various activities in groups with their peers. They would transform their ideas with each other and act on this with the best intelligence. Therefore, they learned mathematical concepts easily and had less mathematical anxiety in comparison to the control group of students. The control group of students was taught through the traditional teaching method. According to the method the teacher taught the students through the chalk-and-talk method, the teacher expressed the solution to mathematical questions on the blackboard and the students understood and wrote it on their subject's copy. They could not communicate on the teaching topic with each other and expressed their ideas on the topic during the teaching time. They were very attentive to learning.

So, the experimental group of students understands easily the mathematical facts and concepts. Therefore, the mathematical anxiety of the experimental group of students was to be reduced effectively. Their learning and understanding of the mathematics subject increased in comparison to the students of the control group.

Due to the effect of the instructional material the students of the experimental group had a low 52.33% mathematical anxiety and the control group of students who were taught through the conventional teaching method suffered a high 67.0% mathematical anxiety. Mathematical anxiety was an obstruction in the way of learning mathematics. The students of high I.Q. who have high mathematical anxiety face many mathematical understanding problems. The students of high I.Q. who have low mathematical anxiety could easily understand the mathematical facts.

Conclusion

Out of the matched experimental and control group on the basis of I.Q., the 11 students of the experimental group of high I.Q. who were taught through the constructivist pedagogy-based

instructional material (teaching modules) have 52.33% mathematical anxiety and the 10 control group students of high I.Q. who were taught by using the conventional teaching method have 67.0%% mathematical anxiety. The experimental group students of high I.Q. have 'average mathematical anxiety' and the control group students of high I.Q. have 'high mathematical anxiety'.

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