

**EFFECT OF CONSTRUCTIVIST PEDAGOGY ON CONCEPT
ATTAINMENT AND ANXIETY IN MATHEMATICS AMONG
SEVENTH CLASS STUDENTS**



SUMMARY

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SUMMARY

Mathematics is more difficult for children than any other subject because they have difficulty understanding the symbols and formulas used in it. Mathematics requires more time and attention to avoid this difficulty. We all know that when we learn facts without understanding then we easily forget facts and in such a situation we are not able to understand that subject and its basic nature. Attention arises when interest arises in a subject and interest arises when it becomes easy to understand the facts related to the subject. When we try to learn without understanding the facts then we start forgetting them because we are not able to connect any subject with our previous knowledge and we are not able to connect that subject with our daily life so subject matter and Theories must be related to our prior knowledge. When learning is relevant we can apply our knowledge to new situations and use our knowledge in our day to day experiences and the knowledge gained becomes permanent. There are many subjects which students learn easily but it is not very correct to say about mathematics because some students consider mathematics very difficult subject but in this regard constructivism plays a pleasant role in understanding the concept of mathematics in which students opportunities are given to create one's own knowledge and this type of knowledge is permanent.

In the construction of knowledge, group learning and a dynamic classroom environment are very important. In this connection, the constructivist approach in mathematics education can play a joyous role to learn mathematical concepts. When students start learning mathematical concepts easily, then their mathematical anxiety starts to decrease. When mathematical concepts, formulas, facts are easy for the students to understand. They generate an interest to practice it. Children solve the learned questions repeatedly by practicing to give them permanent learning. This increases their understanding of the concept, due to their deep understanding of the mathematical concept, their fear of mathematics gradually ends. We can say that as the students' concept attainment ability increases then mathematical anxiety decreases.

Therefore, the researcher is interested to investigate which one of these teaching strategies (constructivist pedagogy and conventional method) will increase

mathematical concept attainment ability and will reduce mathematical anxiety levels in the students. Hence, the present study was conducted under the title:

“Effect of Constructivist Pedagogy on Concept Attainment and Anxiety in Mathematics Among Seventh Class Students.”

Operational Definition of The Terms

- **Constructivism:** Constructivism is a child-centered and child-activity-based learning approach in which the child is the originator of his knowledge based upon his foreknowledge and past experiences.
- **Constructivist Pedagogy:** When we use the constructivist approach in the teaching-learning process to enhance the learning of students, it is called constructivist pedagogy.
- **Concept Attainment:** Concept Attainment is an indirect instructional strategy that uses a structured inquiry process.
- **Effect:** It refers to the outcome of a particular treatment given to the subjects which produce a significant change in a student’s academic achievement or behavior. Here, effect means the responses which are shown by the students when they receive instruction by the Constructivism approach and Traditional teaching method.
- **Traditional Teaching Method:** In this study, the traditional teaching method has been taken as the traditional face-to-face classroom teaching, the teacher is generally an active participant in the teaching-learning process and pupils are almost passive.
- **Mathematical Anxiety:** Mathematical Anxiety is a negative emotional reaction to mathematics that can be debilitated by using effective teaching methods. It is directly connected with mathematics avoidance.

Research Questions of the Study

- What are the effects of constructivist pedagogy on concept attainment in mathematics of seventh class students?

- What are the effects of constructivist pedagogy on anxiety in mathematics of seventh class students?
- How are concept attainment and anxiety in the mathematics of class seventh students affected by intelligence quotient (IQ), socio-economic status (SES), and gender in the experimental and control group?
- What are the views of teachers and students about constructivist pedagogy?

Keeping the aforesaid issues in the mind and exploring the effect of the constructivist pedagogy on the concept attainment and anxiety in the mathematics of seventh class students, the researcher has proposed this problem for the intensive and detailed study.

Objectives of the Study

Main Objectives of the Study

1. To study the effect of constructivist pedagogy on concept attainment in mathematics among seventh-class students.
2. To study the effect of constructivist pedagogy on anxiety in mathematics among seventh-class students.
3. To study the effect of constructivist pedagogy on concept attainment in mathematics among seventh class students on the basis of intelligence quotient.
4. To study the effect of a constructivist pedagogy on anxiety in mathematics among seventh class students on the basis of intelligence quotient.
5. To compare concept attainment in mathematics between experimental and controlled group students on the basis of intelligence quotient.
6. To compare anxiety in mathematics between experimental and controlled group students on the basis of intelligence quotient.
7. To study the effect of constructivist pedagogy on concept attainment in mathematics among seventh class students with respect to their gender.
8. To study the effect of a constructivist pedagogy on anxiety in mathematics among seventh class students with respect to their gender.
9. To compare concept attainment in mathematics between experimental and controlled group students with respect to their gender.

10. To compare anxiety in mathematics between experimental and controlled group students with respect to their gender.
11. To study the effect of constructivist pedagogy on concept attainment in mathematics among seventh class students on the basis of socio-economic status.
12. To study the effect of a constructivist pedagogy on anxiety in mathematics among seventh class students on the basis of socio-economic status.
13. To compare concept attainment in mathematics between experimental and controlled group students on the basis of socio-economic status.
14. To compare anxiety in mathematics between experimental and controlled group students on the basis of socio-economic status.
15. To explore the opinion of teachers and students about the constructivist approach.

Auxiliary Objectives of the Study

1. To develop the instructional material based on the constructivist approach for some specific topics in mathematics for seventh-class students.
2. Construction and standardization of a tool on concept attainment to measure the understanding of some selected concepts in mathematics for seventh-class students.
3. Construction and standardization of a tool on anxiety to measure the level of anxiety in mathematics for seventh-class students.
4. To construct an opinionnaire to explore the student's opinion about the constructivist pedagogy.
5. To construct an opinionnaire to explore the teacher's opinion about the constructivist pedagogy.

Research Hypotheses of the Study

1. There is a significant difference in mathematical concept attainment between experimental and controlled group students.
2. There is a significant difference in mathematical anxiety between experimental and controlled group students.

3. There is a significant difference in mathematical concept attainment of experimental group students on the basis of Intelligence Quotient (IQ).
4. There is a significant difference in mathematical anxiety of experimental group students on the basis of Intelligence Quotient (IQ).
5. There is a significant difference in mathematical concept attainment between experimental and controlled group students on the basis of Intelligence Quotient (IQ).
6. There is a significant difference in mathematical anxiety between experimental and controlled group students on the basis of Intelligence Quotient (IQ).
7. There is a significant difference in mathematical concept attainment of experimental group students with respect to their gender.
8. There is a significant difference in mathematical anxiety of experimental group students with respect to their gender.
9. There is a significant difference in mathematical concept attainment between experimental and controlled group students with respect to their gender.
10. There is a significant difference in mathematical anxiety between experimental and controlled group students with respect to their gender.
11. There is a significant difference in mathematical concept attainment of experimental group students on the basis of Socio-Economic Status (SES).
12. There is a significant difference in mathematical anxiety of experimental group students on the basis of Socio-Economic Status (SES).
13. There is a significant difference in mathematical concept attainment between experimental and controlled group students on the basis of Socio-Economic Status (SES).
14. There is a significant difference in mathematical anxiety between experimental and controlled group students on the basis of Socio-Economic Status (SES).

Delimitation of the Study

The study following these delimitations to process the study-

1. Field of study is restricted to the selected school of Lucknow city.

2. The study is restricted to the students of the school affiliated with the U.P. Board.
3. The study is restricted only to class seventh students.
4. The study is restricted only to Mathematics teaching.
5. The content is limited only to some specific topics of the entire mathematics syllabus of class seventh.

Research Method

The experimental method is used in the present study. The experiment was conducted in two parts.

- **Main Experiment:** Treatment through teaching module based on constructivist pedagogy for experimental group students.
- **Subsidiary Experiment:** Training program on effectiveness of constructivist pedagogy for teachers.

Research Design of the Study

Researcher used ‘Non-Equivalent Post-Test-Only Control Group design’. It is a type of ‘Quasi-Experimental Design’.

The population of the study

The class seventh students of the U.P. Board were the population of the study

Sample and Sampling Technique

- **Sample:** The sample of the present study was 40 students of class seven of Upper Primary School Mukarimnagar, Lucknow city.
- **Sampling Technique:** In the present study, the researcher used purposive sampling for the selection of the school and used simple random sampling to select the students.

Variables of the Study

A. Independent Variables	a)	Constructivist Approach		
	b)	Conventional Teaching Method		
B. Dependent Variables	a)	Concept Attainment		
	b)	Anxiety in Mathematics		
C. Controlled Variables				
1.	Teacher Characteristics			
	a)	Gender	b)	Experience
			c)	Training
2.	Learner Characteristics			
	a)	Gender	b)	Intelligence Level
			c)	SES
	d)	Age		
3.	Classroom Environment			
4.	Teaching Materials			
5.	Teaching Hours			
6.	Grade seventh			
D. Intervening Variables				
	a)	Fatigue	b)	Monotony
			c)	Interest in the subject matter
	d)	Teacher competence	e)	Length of the Study Material
	f)	Parental Guidance	g)	Extra-Coaching

Tools of The Study

1. Group Test of General Mental Ability (Hindi modified 72) by Dr. Shyamswaroop Jalota
2. Socioeconomic Status Scale (SESS) by Dr. Sunil Kumar Upadhyay
3. Concept Attainment Test by Dr. Auradha Joshi & Ratanmala Arya.

4. Mathematical Anxiety Scale by Dr. Ayatollah Karimi & Prof. S. Venkateshan.
5. Concept Attainment Test (CAT) constructed and standardized by researcher and research supervisor.
6. Mathematical Anxiety Scale (MAS) constructed and standardized by researcher and research supervisor.
7. Constructivist Pedagogy Effectiveness Students' Opinionnaire constructed by researcher and research supervisor.
8. Constructivist Pedagogy Effectiveness Teachers' Opinionnaire constructed by researcher and research supervisor.
9. Instructional material based on constructivist pedagogy developed by researcher and research supervisor.
10. Traditional teaching material determined by researcher and research supervisor.

Statistical Techniques

The various statistical techniques were used in the present study to analyze the data. There were used mainly the mean, standard deviation, Pearson correlation coefficient, Percentile, Percentage, Kolomogrov-Smirnov and Shapiro-Wilk Test (KSSW test), Levene's test, and two-tailed t-test.

Conclusion

1. The researcher found that the teaching of mathematics to experimental group students through constructivist pedagogy resulted in an increase in the students' understanding of concepts and a decrease in their mathematical anxiety. Thus, through the use of child-centred teaching approach with various activities through teaching modules based on 7-E constructivist model, the students attempted self-learning in the constructivist classroom, which resulted in increased students' concept acquisition and their mathematical concern decreased.
2. There was no significant difference found on the basis of I.Q., in the concept attainment in mathematics among all the students who were taught using constructivist pedagogy. Similarly, no significant difference was also found in the mathematical anxiety on the basis of I.Q. of the students who were taught

through constructivist pedagogy. The reason behind this is that the high I.Q. and low I.Q. students of the experimental group used to interact with each other in the constructivist class and they actively participated in the activities to solve the mathematical problems, they solved different mathematical problems together. Hence it can be said that it is possible that there is no significant difference in the concept attainment of the students of the experimental group on the basis of their I.Q. Similarly, no significant difference has been found in their mathematical anxiety due to the mentioned reason.

3. The concept attainment of the low experimental group was significantly higher than the concept attainment of the low control group on the basis of I.Q. Similarly, the concept attainment of the high experimental group was significantly higher than the concept attainment of the high control group on the basis of I.Q. and the concept attainment of the low experimental group was significantly higher than the concept attainment of the high control group on the basis of I.Q. The reason for this is that there was two equivalent experimental and control group, the various mathematical activities were done by the teacher and students through the constructivist pedagogy in the experimental group. Therefore, the students were interested in mathematics and due to their good understanding of mathematics, their mathematical concept attainment increased.
4. The mathematical anxiety of the high control group was significantly higher than the mathematical anxiety of the high experimental group on the basis of I.Q. The mathematical anxiety of the low control group was significantly higher than the mathematical anxiety of the low experimental group on the basis of I.Q. The mathematical anxiety of the high control group was significantly higher than the mathematical anxiety of the low experimental group on the basis of I.Q. The reason for this is the students of the control group were taught by the traditional teaching method and they are not given any additional treatment. As a result, the mathematical concept attainment of these students was found to be low and the mathematical anxiety of these students was also found to be high. Therefore, it can be said that the use of constructivist pedagogy in mathematics teaching-learning resulted that the mathematical concept attainment was

significantly increased in the students of the experimental group while their mathematical anxiety has decreased.

5. The concept attainment in mathematics of girls of the experimental group was found significantly higher than the girls of the control group. Similarly, the concept attainment in mathematics of boys of the experimental group was found significantly higher than the boys of the control group, the concept attainment in mathematics of boys of the experimental group was found significantly higher than the girls of the control group, the concept attainment in mathematics of girls of the experimental group was found significantly higher than the boys of the control group.

This proved that the constructivist pedagogy did not affect students on the basis of their gender. The different types of activities were done by the teachers and the students to explain the mathematical concepts to all the students of the experimental group using constructivist pedagogy. So, they got more concept attainment than the students of the control group.

All the students of the control group were not given any type of treatment and they were taught the same mathematics content by using the traditional teaching method. Therefore, those concept attainments were found low. Hence, it can be said that in the experimental group on which the constructivist pedagogy was used their concept attainment was more than the students of the control group. Therefore, constructivist pedagogy has increased the concept attainment but its effect on a particular gender can be said to be negligible.

6. The mathematical anxiety of female students of the control group was found significantly higher than the female students of the experimental group. The mathematical anxiety of male students of the control group was found significantly higher than the male students of the experimental group. The mathematical anxiety of female students of the control group was found significantly higher than the male students of the experimental group. The mathematical anxiety of male students of the control group was found significantly higher than the female students of the experimental group.

This proved that constructivist pedagogy has no effect on students on the basis of their gender. The different types of activities were done by the teachers and the students to explain the mathematical concepts to all the students of the experimental group using constructivist pedagogy. They got lower mathematical anxiety than the male and female students of the control group.

All the male and female students of the control group were not given any type of treatment, they were taught the same mathematics content by using the traditional teaching method. Therefore, the mathematical anxiety of these students was found to be high. Hence, it can be said that in the group in which the constructivist pedagogy was used the students of that group whether they were male or female students their mathematical anxiety was found lower than the male and female students of the control group. Therefore, constructivist pedagogy decreased the mathematical anxiety but its effect on a particular gender can be said to be negligible.

7. The concept attainment in mathematics of high S.E.S. students of the experimental group was found to be significantly higher than the high S.E.S. students of the control group. Similarly, the concept attainment in mathematics of low S.E.S. students of the experimental group was found to be significantly higher than the low S.E.S. students of the control group. The concept attainment in mathematics of low S.E.S. students of the experimental group was found to be significantly higher than the high S.E.S. students of the control group. The concept attainment in mathematics of high S.E.S. students of the experimental group was found to be significantly higher than the low S.E.S. students of the control group.

It can be said that the students who were taught the mathematical concept using the constructivist pedagogy gained more concept attainment than those students who were not given any special treatment and were taught through the traditional teaching method. From this, it can be concluded that using constructivist pedagogy the concept attainment in mathematics of students was increased. If seventh graders use constructivist pedagogy in their mathematical

teaching, no matter what the S.E.S., their mathematical concept attainment must be increased.

The mathematical anxiety in mathematics of high S.E.S. students of the control group was found to be significantly higher than the high S.E.S. students of the experimental group. The mathematical anxiety in mathematics of high S.E.S. students of the control group was found to be significantly higher than the high S.E.S. students of the experimental group. The mathematical anxiety in mathematics of high S.E.S. students of the control group was found to be significantly higher than the high S.E.S. students of the experimental group. The mathematical anxiety in mathematics of high S.E.S. students of the control group was found to be significantly higher than the high S.E.S. students of the experimental group.

From this, it can be said that the students who were taught the mathematical concept using the traditional teaching method have suffered from high mathematical anxiety than those students who were taught through the constructivist pedagogy. From this, it can be concluded that using constructivist pedagogy the mathematical anxiety of the students was decreased. If seventh graders use constructivist pedagogy in their mathematical teaching, no matter what the S.E.S., their mathematical anxiety should be reduced.

8. The opinion of Students about constructivist pedagogy

Constructivist pedagogy was 63.85% effective in learning the mathematics subject which reduced the mathematics anxiety of the students along with increasing the mathematical concept attainment according to them. If the teacher teaches mathematics subjects by using the constructivist pedagogy in different ways and different types of student-teacher activities definitely the students' mathematical concept attainment will increase.

9. The opinion of Teachers about constructivist pedagogy

Constructivist pedagogy was found 83.19% effective in terms of increasing the mathematical concept attainment and reducing the mathematical anxiety of the students. To implement constructivist pedagogy meaningfully in the class, the special dedication of both teacher and students is necessary to

transform education. It can be a challenging task for the teachers, the management of the educational institution, and the government.

Educational Implications of the Study

For Students

- The present study is an example of the significant use of constructivist pedagogy to facilitate and enhance mathematics learning and to reduce the mathematical anxiety of the students.
- Using constructivist pedagogy like the study can increase students' ability to learn mathematical concepts.
- By using constructivist pedagogy, the anxiety can be reduced of the students relative to other subjects.
- The concept attainment of the student related to the other subjects like science and geography can be increased by making proper use of constructivist pedagogy in the teaching-learning process.

For Teachers

- Teachers can use constructivist pedagogy in mathematics teaching to increase the mathematical concept attainment and reduce the mathematical anxiety of learners.
- Teachers can use teaching modules in their teaching-learning process which is developed by the researcher in the present study.
- Teachers can reduce students' anxiety by systematically using constructivist pedagogy in other subjects like Science, Biology, Physics, Geography. History etc., and also increases the concept attainment of students related to these subjects.
- Based on the teaching models in the present study teachers can make constructivist pedagogy-based teaching modules of other subjects to enhance the quality of teaching-learning.
- Teachers can practice making constructivist pedagogy-based teaching modules on the various topics so that if needed in the teaching-learning process they can

immediately make constructivist pedagogy-based teaching-learning planning on the chapters related to the selected subjects and administer in the class.

For School/Educational Institution

- Students of class seventh can be taught through constructivist pedagogy using all 10 modules which are developed by the researcher to attend the good concept attainment in mathematics and reduce the mathematical anxiety of the students.
- School administrators should encourage the teacher to use constructivist pedagogy in the teaching-learning process. So that they can be able to diagnose various known and unknown problems related to the learning of the students.
- School administrators should make available various constructivist pedagogy-based teaching-learning materials in the school so that teachers can use them when needed for enhancing teaching-learning.

For Government

- The entire mathematical chapters should be made on the basis of constructivist approach for primary and upper primary class so that the mathematical textbook can become more student-centric, learnable, simple, and meaningful for mathematics practices. The result of the present study will be an example for it.
- Constructivist pedagogy-based teacher training and workshops must be organized by the government to train the teachers.
- Textbook lessons of other subjects like Science, History, Geography, etc., can be made simpler and more understandable for the students by making it constructivist pedagogy based.
- The government should organize various encouraging programs for teachers to use of constructivist pedagogy in classroom teaching-learning.

In Global Perspective

- Developed and standardized the 'Concept Attainment Test' can be used to measure the mathematical concept attainment of class seventh students.
- Developed and standardized the 'Mathematical Anxiety Scale' can be used to measure the mathematical anxiety of class seventh students.

Limitations of the Research

1. Developed instructional material intended for use by class seventh students, results may be different when applied it on the students of other grades.
2. Developed and standardized 'Concept Attainment Test' is only for knowing the mathematical concept attainment of class seventh students. Results may be different when applied it on the students of another grades.
3. Developed and standardized 'Mathematical Anxiety Scale' is only for knowing the mathematical anxiety of class seventh students. Results can differ when applied it on the students of another grades.
4. The effect of constructivist pedagogy was analyzed on the concept attainment and anxiety in mathematics among the students of seventh grade only. Applying the same experiment on the students of the other grades the obtained result may differ.

Suggestions for Further Research

The investigator submits the following suggestions for further researches-

1. The present study may be replicated taking a large sample of the students from C.B.S.E., I.C.S.E., and another board.
2. The present study may be replicated taking the students of other educational levels.
3. Similar studies can be taken by considering other variables.
4. Similar studies can be taken by considering other teaching techniques.
5. The present study may be replicated to teach other subjects.

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