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EFFECTIVENESS OF COGNITIVE APPRENTICESHIP MODEL ON ACHIEVEMENT IN DIMENSIONS OF COGNITIVE PROCESSES AMONG SECONDARY SCHOOL STUDENTS IN MATHEMATICS SUBJECT

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Abstract:

The main aim of this study is to find out effectiveness of cognitive apprenticeship model on achievement in dimensions of cognitive processes among secondary school students in mathematics subject. The investigator used pre-test –post-test non-equivalent group design. This study is conducted on the population of secondary school students in Davangere district. The present study will be conducted on the representative sample of 80 students of IX standard of Davangere district. Self-prepared achievement test containing 50 questions of 1 mark each was used for data collection. The result shows that there exist significant difference between the post-test mean score of experimental group and control group of all dimensions of cognitive processes

Key Words: effectiveness, cognitive apprenticeship model, achievement, cognitive processes

1. Introduction:

The concept of Cognitive Apprenticeship model originates from social constructivist theory based on the work of Vygotsky and it is also related to the situation theory by Brown, Collins, and Duguid, (1989). Situated cognition is a theory of instruction that suggests that learning is naturally an authentic activity, context and culture. Cognitive Apprenticeship provides practical steps for applying situated cognition theory. This model is also supported by Bandura's theory of modelling which postulates that for modelling to be successful, the learner must be attentive, must have access to and retain the information presented, must be motivated to learn and must be able to reproduce the desired skill Bandura (1997). The

detailed Theoretical description about the theoretical aspects of the Cognitive Apprenticeship Model is presented below. Collins, Hawkins & Carver (1991) define cognitive apprenticeship as a model of instruction that acknowledges community as part of a culture and makes thinking visible.

They propose three methods for applying cognitive apprenticeship to a learning environment such as a classroom. First, teachers and students should identify the underlying processes of the task and implemented strategies that serve to make the thinking of both teacher and student explicit. Second, teachers have a responsibility to situate abstract tasks in authentic contexts, which allow students to understand the relevance of the work, and see a place for their experience in institutional educational contexts. Third, teachers should vary the context, incorporate a range of tasks with varying levels of difficulty, and articulate the common themes, which may enable students to gradually develop expertise.

Cognitive apprenticeship is a process by which learners learn from a more experienced person by way of cognitive and metacognitive skills and processes. Effective teachers "involve" students in learning as apprentices: they work alongside students and/or set up situations that will cause students to begin to work on problems even before fully understanding them. In addition, teachers are encouraged to provide students with varying kinds of practice situations before moving on to more challenging tasks, allowing an understanding that surpasses the use of formulas. Applied instructional methods-those traditionally used in vocational education-provide the ideal vehicle for this shift to a more realistic context in the teaching of writing and other "academic" subjects. As applied methods are adapted for use in the academic domains, an integrated curriculum should emerge and possess the potential to enhance achievement for all students. This method incorporates the basic elements of a cognitive apprenticeship, using the method of modeling, coaching and fading and of encouraging student reflection on their own problem solving processes.

2. Need and significance of the study:

In the last few years have witnessed a rapidly growing interest in the learner cantered approach to education which aims at replacing passive lecture methods construction. In our educational system some students need to be explicitly taught how to strategically approach academic tasks in order to gain and use information effectively. In other words, they need to be taught effective study strategies, often referred to as study skills.

Although effective study skills strategies are critical for academic success, for many reasons students are seldom taught them. Perhaps chief among these reasons is simply that teachers assume students already possess such skills, having picked them up in the earlier grades. For this reason, study skills instruction improves the academic outcomes of all students.

Metacognitive skills are important organizers of all of the tasks that we perform. They enable planning, setting goals, initiating work, sustaining future oriented problem solving activities, monitoring and managing progress on tasks to detect and correct errors, and keeping track of the effect of one's behaviour on others .For the better academic achievement of the students it should need to introduce a good teaching strategy that is the method of cognitive apprenticeship model.

The aim of the study is to improve the academic achievement of secondary school students with the help of cognitive apprenticeship model. Cognitive apprenticeship model in a specific learning domain in a highly structured environment.

This means that there is a fixed rule before and any examples are seen. Then by student got a clear idea about what is going to learn. The main purpose of this study is intended to focus students' attention on the lesson. It creates a cognitive frame work for organizing the skills strategies or concept to follows. It have extended understanding and application of new learners. It can stimulate students interest and involvement in lesson. In order to full fill the above objectives to tackle the problem low achievement of students in Mathematics and make Mathematics is an enjoyable one

3. STATEMENT OF THE PROBLEM

The study is entitled as - **EFFECTIVENESS OF COGNITIVE APPRENTICESHIP MODEL ON ACHIEVEMENT IN DIMENSIONS OF COGNITIVE PROCESSES AMONG SECONDARY SCHOOL STUDENTS IN MATHEMATICS SUBJECT**

4. Objectives of the study:

In order to achieve the study, the following objectives were stated

1) To compare the effectiveness of Cognitive apprenticeship model over existing constructivist method on achievement in Mathematics under the following dimensions of cognitive processes.

1. Remembering
2. Comprehending
3. Applying
4. Creating

2) To find out the effectiveness of Cognitive apprenticeship model on achievement in Mathematics among secondary school students.

5. Hypotheses of the study:

1) There exists a significant difference in the Pre-test and Post-test mean scores of Achievement in Mathematics taught through Cognitive apprenticeship model and Constructivist method with reference to the following Dimensions.

1. Remembering
2. Comprehending
3. Applying
4. Creating

2) There exists a significant difference in the Pre-test and Post-test mean scores in Mathematics of secondary school students taught through the Cognitive apprenticeship model at all dimensions of Remembering, Understanding, Applying and Creating

6. Methodology of the study:

6.1.Design of the study:

The investigator used pre-test –post-test non-equivalent group design.

6.2.Population of the study:

This study is conducted on the population of secondary school students in Davangere district.

6.3.Sample of the study:

The present study will be conducted on the representative sample of 80 students of IX standard of Davangere district.

6.4. Tool used for data:

Self-prepared achievement test containing 50 questions of 1 mark each was used for data collection. This tool has been prepared and standerdised based on standardised process of tool preparation. Among 50 questions 13 questions represents Remembering, 13 questions represents Understanding, 12 questions represents Applying and 12 questions represents Creating

7. Data analysis and interpretation:

1) Objective 1: To study the effectiveness of Cognitive apprenticeship model on achievement in Mathematics with reference to following dimensions of cognitive processes.

1) Remembering
2) Understanding
3) Applying
4) Creating

Table -1: Data and result of significance of the difference between mean pre-test and post-test scores of Achievement in Mathematics of the Experimental and Control group under the Remembering domains

Cognitive process	Test	Experimental Group		Control group		t-value	
		Mean	SD	Mean	SD	Pre-test	Post-test
Remembering	Pre-test	10.12	1.22	10.56	1.11	1.11 NS	4.28
	Post-test	45.12	0.98	15.11	0.99		

** Significant at0.01 level of significance, NS- Non Significant

Table- 1 shows that the value of independent sample t- test experimental group and control group for the post test scores of Remembering dimension is found to be t(80) = 4.28, p= 0.01 which is greater than the table value 2.58 at 0.01 level of significance therefore there exist significant difference between the post-test mean score of experimental group and control group of all dimensions of cognitive processes.

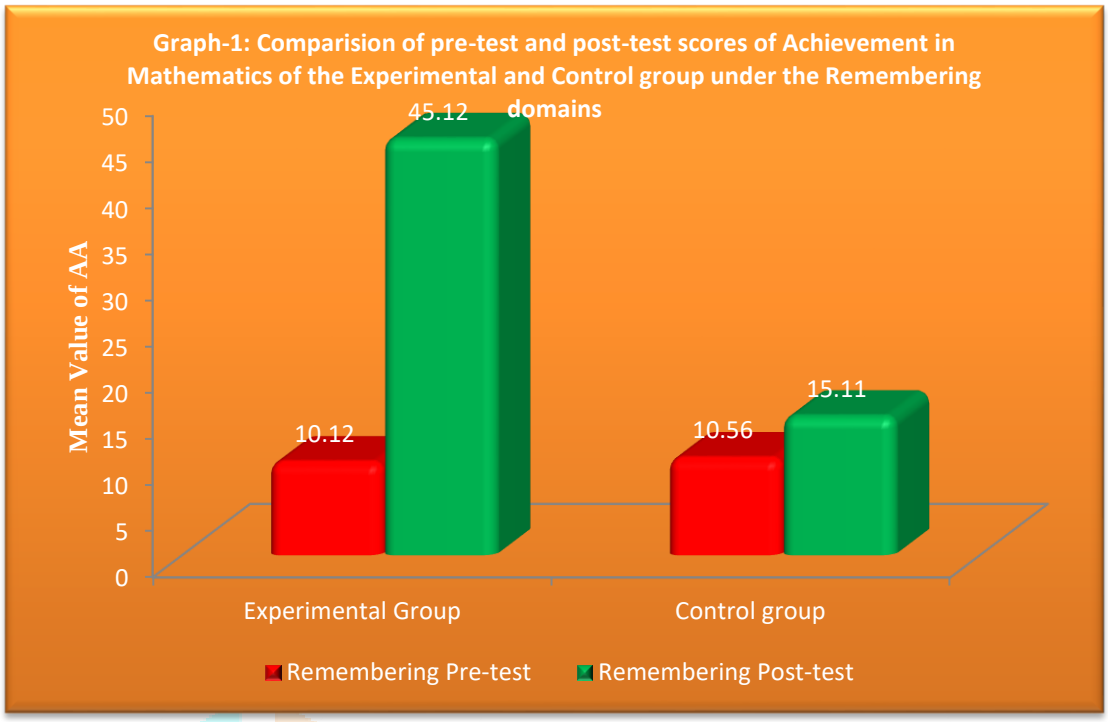


Table -2 Data and result of significance of the difference between mean pre-test and post-test scores of Achievement in Mathematics of the Experimental and Control group under the Understanding domains

Cognitive process	Test	Experimental Group		Control group		t-value	
		Mean	SD	Mean	SD	Pre-test	Post-test
Understanding	Pre-test	1.78	0.90	2.43	0.84	1.01 NS	3.81
	Post-test	5.38	2.44	3.73	1.24		

** Significant at0.01 level of significance, NS- Non Significant

Table- 2 shows that the value of independent sample t- test experimental group and control group for the post test scores of Understanding dimension is found to be t(80) = 3.81,p = 0.01 which is greater than the table value 2.58 at 0.01 level of significance therefore there exist significant difference between the post-test mean score of experimental group and control group of Understanding dimension of cognitive processes.

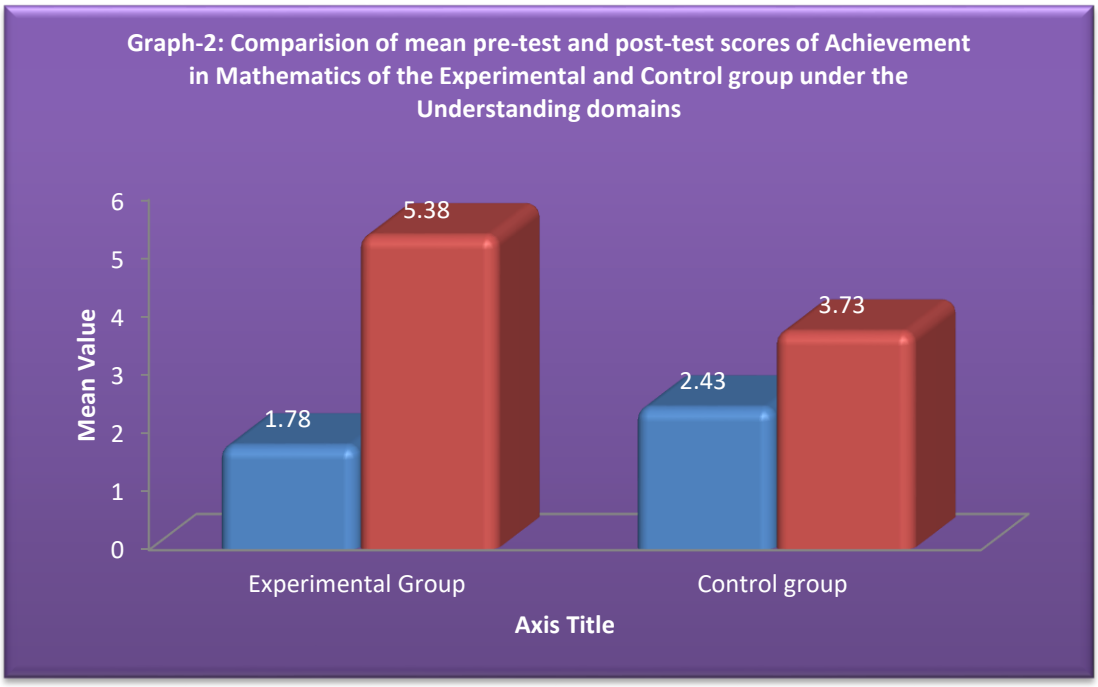


Table -3: Data and result of significance of the difference between mean pre-test and post-test scores of Achievement in Mathematics of the Experimental and Control group under the Applying domains

Cognitive process	Test	Experimental Group		Control group		t-value	
		Mean	SD	Mean	SD	Pre-test	Post-test
Applying	Pre-test	1.97	0.72	1.66	0.53	1.11 NS	5.20
	Post-test	6.65	1.44	3.31	0.78		

** Significant at0.01 level of significance, NS- Non Significant

Table- 3 shows that the value of independent sample t- test experimental group and control group for the post test scores of Applying dimension are found to be t(80) = 5.20, p = 0.01 which is greater than the table value 2.58 at 0.01 level of significance therefore there exist significant difference between the post-test mean score of experimental group and control group of all dimensions of cognitive processes. Hence the two groups differ significantly with respect to Applying dimension.

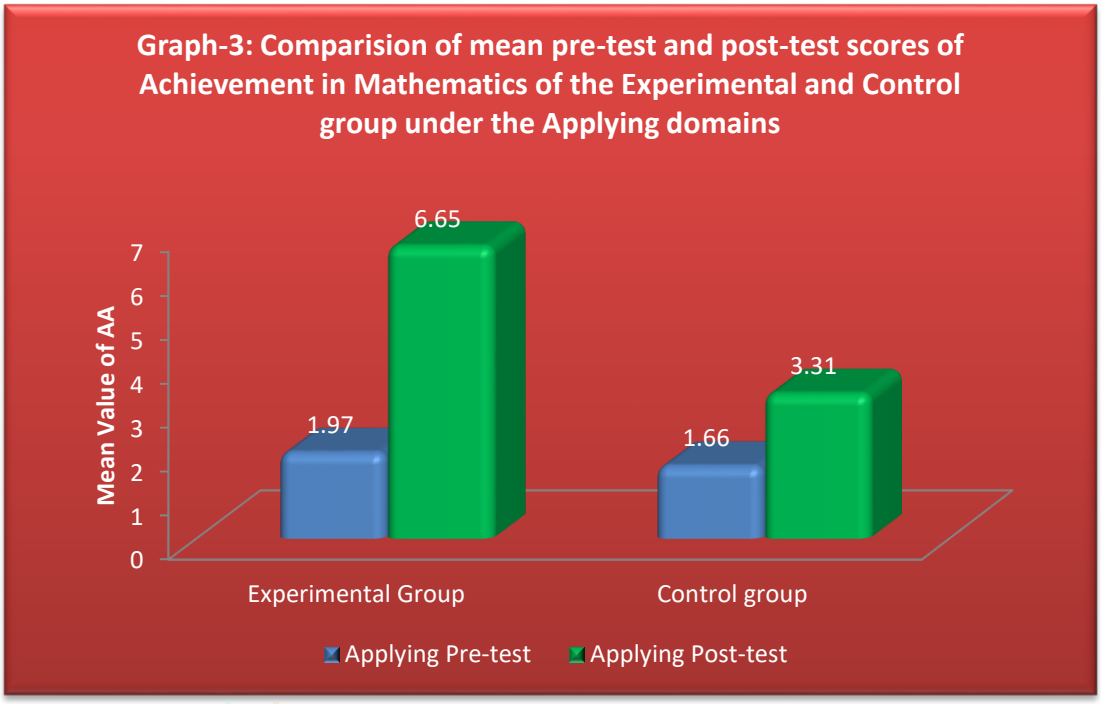
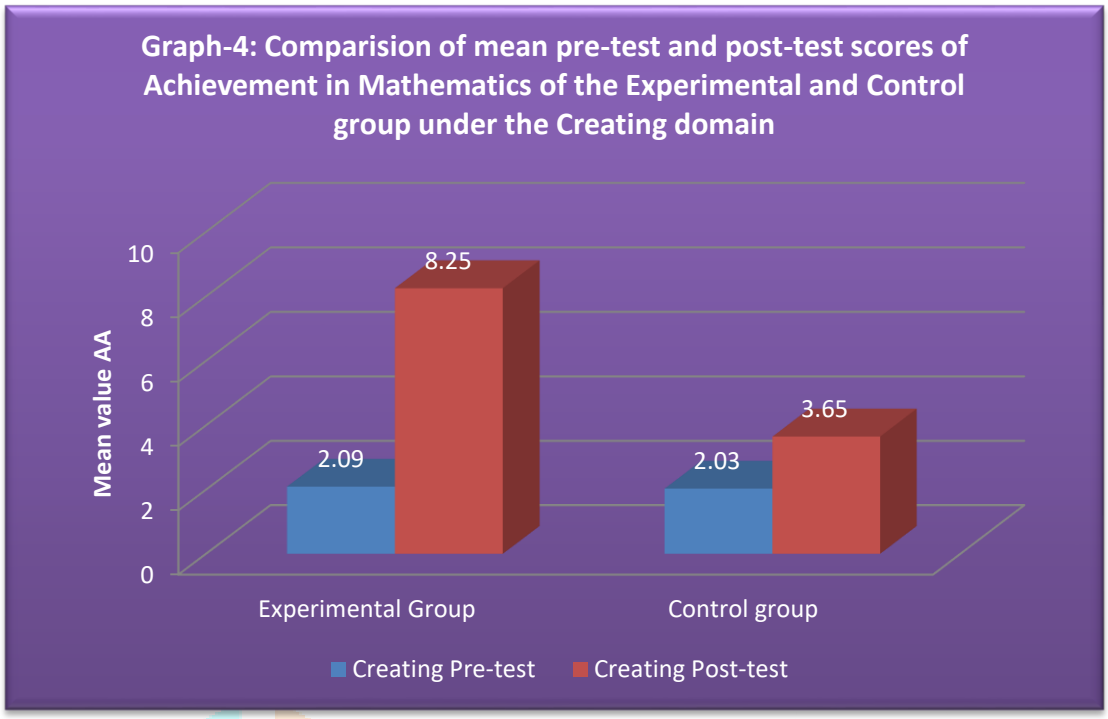


Table -4: Data and result of significance of the difference between mean pre-test and post-test scores of Achievement in Mathematics of the Experimental and Control group under the Creating domain

Cognitive process	Test	Experimental Group		Control group		t-value	
		Mean	SD	Mean	SD	Pre-test	Post-test
Creating	Pre-test	2.09	0.65	2.03	1.00	1.25 NS	5.80
	Post-test	8.25	0.16	3.65	1.10		

** Significant at0.01 level of significance, NS- Non Significant

Table- 4 shows that the value of independent sample t- test experimental group and control group for the post test scores of Creating dimension is found to be t(80) = 5.80, p= 0.01 respectively which is greater than the table value 2.58 at 0.01 level of significance therefore there exist significant difference between the post-test mean score of experimental group and control group of all dimensions of cognitive processes. Hence the two groups differ significantly with respect to final achievement at all dimensions of Remembering, Understanding, Applying and Creating.



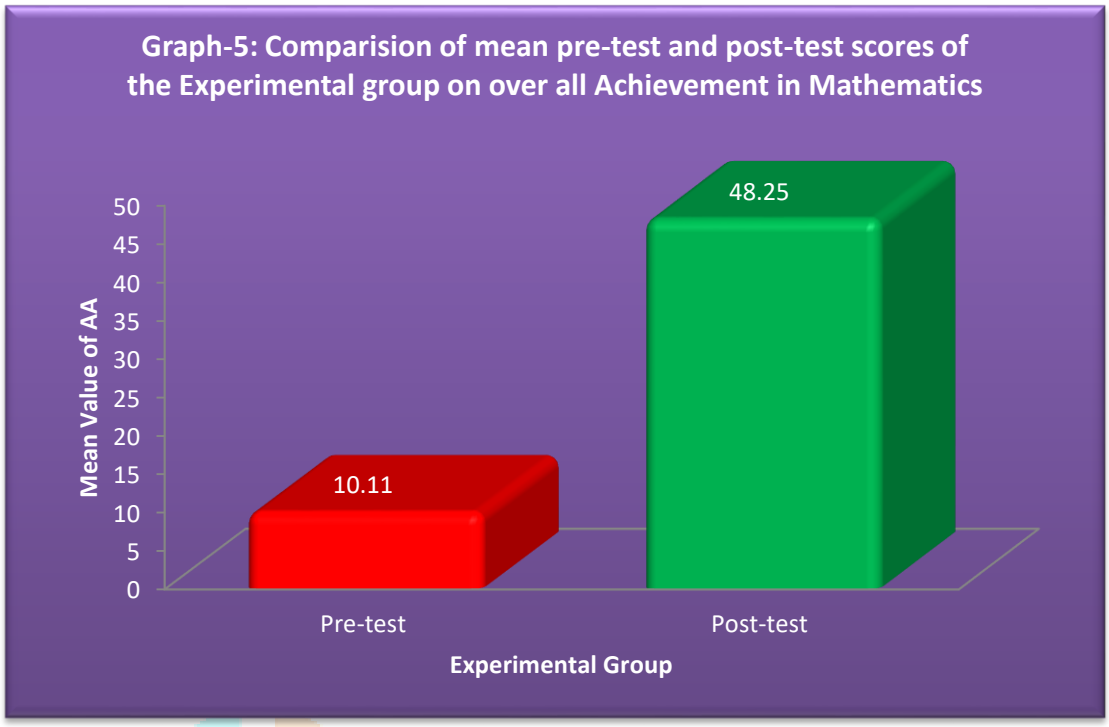
2) **Objective 2: There exists a significant difference in the Pre-test and Post-test mean scores in Mathematics of secondary school students taught through the Cognitive apprenticeship model at all dimensions of Remembering, Understanding, Applying and Creating**

Table -1 Data and result of significance of the difference between mean pre-test and post-test scores of the Experimental group on Achievement in Mathematics.

Experimental group	Mean	Standard deviation	t-value	Significance
Pre-test	10.11	4.15	14.56	Significant
Post-test	48.25	5.12		

** Significant at 0.01 level of significance

Table -5 shows that the value of paired sample t-test for the pre-test and post-test mean score of the experimental group is t (40) = 14.56, p = 0.01, which is greater than the table value 2.58, therefore the null hypotheses is rejected (H_01) at 0.01 0 level of significance. There exists significance difference between pre-test and post-test mean scores of Achievement in Mathematics taught through Cognitive apprenticeship model. Hence it can be concluded that the Cognitive apprenticeship model is effective in teaching Mathematics at ninth standard students. Hence the two groups differ significantly with respect to final achievement at all dimensions of Remembering, Understanding, Applying and Creating.



8. Educational implications:

The study reveals that cognitive apprenticeship model has significant effect on improving achievement in Mathematics among secondary school students. The major implications of the study are:

1) Cognitive apprenticeship method is student cantered active teaching method. It can encourage student-teacher interaction when they really create a map together through discussion.
2) This model gives importance to group activities.
3) Cognitive apprenticeship model helps to improve interpersonal relationship of the students.
4) Cognitive apprenticeship model helps to reduce tension and boredom that pupils face while doing difficult tasks.
5) This model improves self-learning method for the student's and also helps them to do the problems actively.
6) This model make use of different media for the presentation of the activities in the class can be given a chance to the learners to comment, compare, and think about various ideas that they come up with and create a dynamic interaction among them.

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