INFLUENCE OF COOPERATIVE LEARNING ON ACHIEVEMENT IN MATHEMATICS

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Education is a process of learning from real life and from the pulsating dynamic society around us; and the learning should be at the choice and pace of the learner and for all his life span. Education must stem from the roots of society; so have its living conditions and problems and strive towards the fulfillment of its goals and aspirations. It is only in this way that education becomes relevant to life and even makes its contributions to the development of the individual as well as the society. Life long learning from all external sources and inner experience is both the process and purpose of education and way of using one's learning determines the range and quality of life experience.

Importance of Mathematics

Mathematics is queen of science it is also called the science of logical reasoning. "Mathe¬matics is a way to settle in the mind a habit of reasoning". In mathematics the results are developed through a process of reasoning. The reasoning in mathematics is of peculiar kind and possesses a number of characteristics such as simplicity, accuracy, certainty of results, originality, similarity to the reasoning of life, and verification.

One cannot do without the use of fundamental processes of mathematics in daily life. A person may belong to the lowest or the highest class of society, say, an engineer, a businessman, doctor even a laborer has got to calculate his wages, make purchases from the market, and adjust the expenditure to his income. Whosoever earns and spends uses mathematics, and these cannot be anybody who lives without earning and spending. In this sense, mathematics has the utilitarian value.

Concept of Cooperative Learning (CL)

The education system should provide positive learning experiences so that learners become responsible citizens. Only responsible citizens can bring about sustainable development. Co operative Learning (CL) approach has the potential to become an effective strategy for ESD.

CL is a teaching strategy involving students' participation in group learning that emphasizes constructive interaction. It is a strategy by which small teams, each with students of different levels of ability, are engaged in learning activities to improve their understanding of a subject. The participation of every student in the group and cooperation among group members is considered important. The students enjoy their individual and collective efforts.

There is a difference between simply having students work in a group and structuring groups of students to work cooperatively. Putting students into groups does not necessarily make for a cooperative relationship; it has to be structured and managed by a teacher. According to Johnson, Johnson, Stanne, (2000), CL is actually a general term that refers to numerous methods for organizing and conducting classroom instruction. Almost any teacher can find a way to use CL that goes well together with his or her philosophies and practices. There are many forms or techniques are most effective when they include a careful use of certain elements. The essential elements of CL have been well studied and laid down.

Key Elements of Cooperative Learning

Cooperative efforts can be expected to be more productive than competitive and individual efforts under certain conditions. These conditions are:

a. Clearly perceived positive interdependence.
b. Considerable motivational (face-to-face) interaction
c. Clearly perceived individual accountability and personal responsibility to achieve group's goals
d. Frequent use of the relevant interpersonal and small group skills
e. Frequent and regular analysis of the functioning of the group, to improve its future effectiveness.

Significance of the Study

In summary, self-regulated learning is an important aspect of learning and achievement in academic contexts. Students who are self-regulating are much more likely to be successful in school, to learn more, and to achieve at higher levels. Accordingly, it is important for schools and classrooms to attempt to foster the development of expertise in self-regulated learning. Of course, there are developmental, motivational, and contextual factors that can facilitate or constrain self-regulated learning, but there are implicit and explicit ways to help foster self-regulated learning. In the twenty-first century and as the explosion of information and multiple ways of learning increase, it will become even more important that individuals know how to self-regulate their learning and that fostering self-regulated learning becomes an important goal for all educational systems.

Motivation is of particular interest to Educational psychologists because of the crucial role it plays in student learning. However, the specific kind of motivation that is studied in the specialized setting of education differs qualitatively from the more general forms of motivation studied by psychologists in other fields.

Motivation in education can have several effects on how students learn and their behavior towards subject matter (Ormrod, 2003). It can:

1. Direct behavior toward particular goals
2. Lead to increased effort and energy
3. Increase initiation of, and persistence in, activities
4. Enhance cognitive processing
5. Determine what consequences are reinforcing
6. Lead to improved performance:-

Because students are not always internally motivated, they sometimes need situated motivation, which is found in environmental conditions that the teacher creates.

There are two kinds of motivation:

- Intrinsic motivation occurs when people are internally motivated to do something because it either brings them pleasure, they think it is important, or they feel that what they are learning is morally significant.
- Extrinsic motivation comes into play when a student is compelled to do something or act a certain way because of factors external to him or her (like money or good grades).

Note also that there is already questioning and expansion about this dichotomy on motivation, e.g., Self-Determination Theory.

As students become more skilled at using metacognitive strategies, they gain confidence and become more independent as learners. Independence leads to ownership as student's realize they can pursue their own intellectual needs and discover a world of information at their fingertips.

The task of educators is to acknowledge, cultivate, exploit and enhance the metacognitive capabilities of all learners.

Title of the Study

A study of Self-regulated learning and Achievement in Mathematics of students of X standard

Objectives of the Study

1. To study the achievement of students in Mathematics at high school level.
2. To throw light on cooperative learning
3. To trace the effectiveness of cooperative learning in enhancing Achievement in Mathematics of students of X standard

Limitations of the Study

The limitations of the study is as follows.

1. This study is limited to the pupils studying in standard X.

Hypotheses

1. There will be no significant difference in the mean scores for achievement in Mathematics in the pre-test between control group and experimental group.
2. There will be no significant difference in the mean scores in achievement in Mathematics between the pre-test and Post-test for the control group.
3. There will be no significant difference in the mean scores Achievement in Mathematics between the pre-test and Post-test for the experimental group
4. There will be no significant difference in the mean scores in Achievement in Mathematics for the Post-test between control group and experimental group.
5. Gap closures in experimental groups will be greater than those in control group.

Statement of the Problem

To what extent co operative learning will be effective in enhancing achievement of the students of X standard in Mathematics?

Sample Selected For the Experimental Study

Table: 4 Distribution of the final sample in the control and experimental groups of the study

Name of the School	Group		Total
	Control group	Experimental group	
Govt.High.School, Keelaveli,	30	30	60

Method of Experimental Study

The investigator had employed three study phases which include two test phases for the collection of data and manipulation of experimental variables (i.e., content and method) of the study.

10 teaching sessions (45 minutes each) were required for this entire study in each session of the school. Students from Government Higher secondary school, Coimbatore were involved in the study.

Phase-1

Development of packages for the teaching the units employing concept attainment strategies and preparation of tools were the two tasks concerned with Phase I. In this phase, the investigator has developed the Self regulated learning strategy Lesson Plans and Criterion Referenced Tests, Pilot study for the validation of CRT to establish validity and reliability of the tools at this stage.

Phase-2

In the second phase of the study, the investigator conducted the pre-test on the sample selected from grade X. The investigator taught the unit 'Mathematics' to all the students by Conventional Method of Teaching. The topic was covered within fifteen days by taking one contact session of 45 minutes per day. One period (teaching session of 45 minutes) each was taken to teach each sub units on Mathematics.

After completing these units, on the eleventh day, a pre-test is administered by using the CRT, to assess the achievement of cognitive skills in 'Mathematics'.

Phase – 3

Students were divided into two groups by random selection to form the control and experimental groups. The experimental group was called as CAM (concept attainment model) group. The students of CAM group were given reinforcement through Self regulated learning strategy for duration of ten teaching periods. Special care was also taken to avoid the meeting of the students of the experimental and control groups during these intervals. The students of the control group were sent out of the class and were not given any type of reinforcement on the content on Mathematics. After giving reinforcement to the experimental groups through CAM and all the students including the control group were called together and a Post - Test was administered on the same day, with the help of the same CRT.

Variables Controlled during the Experimental Phases

- The investigator himself taught the unit to the whole group of students through Conventional Teaching Method. Thus 'teacher variable' was controlled.
- The CAM was employed as a reinforcement strategy to the students in the experimental groups selected for the study. Thus, the treatment variables were controlled.
- The students participated in the pilot study and pre-study were not involved in the sample selected for the main study.
- The experimental groups were given reinforcement through CAM simultaneous.

Cooperative Learning strategy

Analysis and Interpretation

There will be no significant difference in the mean scores in Achievement in Mathematics between experimental group and control group in the pre-test performance.

Pre-Test Performance Control Group and Experimental Group

Group	N	Mean	SD	"t" value	Significance
Control	30	26.50	7.96	0.57	NS
Experimental	30	25.30	8.94		

df = 58 t (0.05) = 1.96 t(0.01) = 2.58

There is no significant difference in the mean scores in Achievement in Mathematics between experimental group and control group in the pre-test performance.

There will be no significant difference in the mean scores in Achievement in Mathematics between pre-test and post test performance for control group.

Pre-Test / Post – Test Performance for Control Group

Type	N	Mean	SD	"t" value	Significance
Pre	30	26.50	7.96	1.02	NS
Post	30	28.83	9.66		

df= 58 t (0.05) = 1.96 t(0.01) = 2.58

There is no significant difference in the mean scores in Achievement in Mathematics between pre-test and post test performance for control group.

There will be no significant difference in the mean scores in Achievement in Mathematics between pre-test and post test performance of Experimental group.

Pre-Test / Post – Test Performance for Experimental Group

Type	N	Mean	SD	"t" value	Significance
Pre	30	25.30	8.94		
Post	30	36.83	7.30	5.35	S

df=58 t (0.05) = 1.96 t(0.01) = 2.58

There is significant difference in the mean scores in Achievement in Mathematics between pre-test and post test performance of Experimental group.

There will be no significant difference in the mean scores in Achievement in Mathematics between experimental group and control group in the post-test performance.

Post-Test Performance Control Group and Experimental Group

Group	N	Mean	SD	"t" value	Significance
Control	30	28.83	9.66	3.62	S
Experimental	30	36.83	7.30		

df=58 t (0.05) = 1.96 t(0.01) = 2.58

There is significant difference in the mean scores in Achievement in Mathematics between experimental group and control group in the post-test performance.

Interpretation

This is an experimental study with pretest post test equivalent group design. Entry behaviour test was conducted to separate control and experimental group to assess the prerequisite knowledge Both the groups are identical and this indicates the nature of identicalness in tune with the pre-test mean scores of both groups. All the pre-test 't' value for control and experimental reveal no significant difference among control and experimental groups. This establishes their identical nature and no significant achievement in their pre-requisite knowledge.

The means of pre-test scores and post-test scores of control as well as experimental groups differ significantly (0.01 level) with the post test mean being greater than the pretest mean. The implication of that is that the level of acquiring of the basic skills in Mathematics has increased due to traditional method in control group and concept attainment in experimental group.

The post test scores of control and experimental group differ significantly. The means score of experimental group is greater than of control group.

Implications

1. Coperative learning plays a vital role in augmenting knowledge in Mathematics.
2. Through Coperative learning cause and effect relationship may be established.
3. Coperative learning cherishes one's power of reflective thinking.
4. Coperative learning inculcates skills among students which indirectly help one to become a promising Mathematician.
5. The things highlighted above are the antecedent skills for a blossoming Mathematician.