SUMMARY

INTRODUCTION

One of the important goals of education is to improve both academic achievement and Physics relations in school. There is an urgent need to practice alternative education programs or instructional methods to solve the problem of students’ poor achievement as well as an attempt to provide environments and curriculum that meet the needs of students.

Among the methods for changed outline in the new reform-movement for teaching Physics is a recommendation for using different instructional methods. Such as cooperative learning, for building students’ capacity for thinking and reasoning, (Mevareeh, 1999). The report of the National Governor's Association, Washington (Brown and Goren, 1993), indicated the following.

In cooperative learning, small groups of students of mixed ability work together to solve problems and complete tasks. In this setting, lower achieving students can model the study skills and work habits of more proficient students. In the process of explaining the material, higher achieving students often develop greater mastery themselves by developing a deeper understanding of the task or skill.

Cooperative learning is an instructional technique designed to promote the academic and Physics development of students. It is one of the most common techniques used by educators throughout the world especially in United States (Johnson and Johnson, 2000). Johnson and Johnson et. al. (1991) proposed five elements are essential for increasing the likelihood of success of the cooperative learning endeavor.

• Positive Interdependence
• Face to face promotive interaction
• Individual Accountability
• Physics Skills
• Group Processing
According to Salvin (1984), the reason for the success of cooperative learning as an instructional method is that by rewarding groups as well as individuals, peer norms come to favour rather than oppose achievement. The use of cooperative tasks and cooperative incentives is necessary to maximize the results (Slavin, 1984). Evidence suggests that heterogeneous grouping in which students are mixed within groups according to ability, sex and ethnic background, is also an important factor in bringing out the best in students (Slavin, 1986; Johnson and Johnson, 1987).

Present study is an attempt to study the effectiveness of Student Teams Achievement Divisions (STAD) and Group Investigation(GI) adoptable to more subjects and grads levels. In STAD (Slavin, 1986) Students are assigned to four-member learning teams that are mixed in performance level. The teacher presents a lesson and the students work within their teams to make sure that all team members have mastered the lesson. Finally, all students take individual quizzes on the material, at this time, they may not help one another and their quiz score are summed to form team scores and team which achieve certain standards may earn rewards. Whereas in Group Investigation is structured to emphasize higher order thinking skills such as analysis and evaluation in a general classroom. In its organization plan, students work in small groups using cooperative inquiry, group discussion and cooperative planning projects. In this method, students form their own two to six members groups. After choosing sub-topics from a unit being studied by the entire class, the groups further break their sub-topics into individual tasks and carry out activities necessary to prepare group reports. Each group then makes a presentation or display to communicate its findings to the entire class.

A lot of studies have been conducted in cooperative learning with respect to achievement. Besides this, research needs to be conducted to determine the effectiveness of cooperative learning on seventh graders for teaching subjects such as Physics.

The present study is an attempt to study the effectiveness of cooperative learning on achievement of seventh graders by teaching Physics in India. The results of the present study are expected to benefit the teacher, teacher educators and students keeping in view the importance of Physics, the present study was planned. Physics was selected, as it is one of the most important subjects in the school curriculum.
NEED OF THE STUDY

Research on student thought processes is based on the belief that teaching is mediated by student thought processes and that teachers influence student achievement, not directly but by causing students to think and behave in certain ways (Wittrock, 1986). Cooperative learning is one of the teaching learning methods which is not expensive, makes learning easier and more enjoyable for the students. It is an easy technique to implement in the classroom, particularly in block scheduled time table. The rationale for using cooperative learning techniques is that the principles on which they are grounded are important not only for helping people to work together better, but also for recognizing every one's gifts and strengths. Experimental studies show that cooperative learning methods have positive benefits to students (enhanced academic achievements) questions continue to surface about students performance in small group settings. It seems that not all students receive the same benefit from participation in heterogeneous cooperative learning groups.

Physics is considered to be an exceptionally difficult subject among various students. The percentage of marks in middle and high school examinations in this subject is low in comparison to other subjects of the school curriculum. This backwardness in subject may be due to the lack of interest and wrong methods of learning.

In cooperative learning settings, heterogeneous group of students of mixed abilities help each other to learn by discussing the things which, include self-effort and understanding.

Cooperative interdependence in classroom settings is the base of many interventions designed to improve both academic achievement and social interaction in schools and as such has been a primary focus in educational and Physics psychological literature for more than three decades. The investigator believes that it is natural tendency of children to grow and learn through Physics interaction and that understanding cooperative interactions within school contents will not only help children achieve educational goals but also create more long term benefits for human kind.
Though number of studies have been conducted abroad with students at middle school level regarding other school subjects achievement but fewer have focused in India for development of achievement in Physics. Our purpose in this study was to help bridge this gap in, the research literature by investigating the effects of cooperative learning on students achievement in Physics.

**STATEMENT OF THE PROBLEM**

A STUDY OF THE EFFECTIVENESS OF STUDENT TEAM ACHIEVEMENT DIVISION (STAD) AND GROUP INVESTIGATION (GI) METHODS OF COOPERATIVE LEARNING ON HIGH SCHOOL STUDENTS.

**OBJECTIVES OF THE STUDY**

1. To compare the mean achievement-scores of two groups of pupils taught Physics without the use of cooperative learning method (STAD) before the experimental treatment.

2. To compare the mean achievement-scores of two groups of pupils taught Physics without the use of cooperative learning method (GI) before the experimental treatment.

3. To compare the mean achievement scores of two groups of pupils taught Physics with and without the use of cooperative learning method (STAD) after the experimental treatment.

4. To compare the mean achievement scores of two groups of pupils taught Physics with and without the use of cooperative learning method (GI) after the experimental treatment.

5. To compare the mean gain achievement scores of two groups of pupils taught Physics with and without the use of cooperative learning method (STAD) after the experimental treatment.

6. To compare the mean gain achievement scores of two groups of pupils taught Physics with and without the use of cooperative learning method (GI) after the experimental treatment.
HYPOTHESES

In terms of hypotheses, the objectives of the study would translate themselves as:

H₁: At the end of experimental treatment the group of students taught Physics through cooperative learning method Students Team Achievement Division (STAD) scores significantly higher on the achievement test than the group of students taught through the traditional method.

H₂: At the end of experimental treatment the group of students taught Physics through cooperative learning method Group Investigation (GI) scores significantly higher on the achievement test than the group of students taught through the traditional method.

H₃: At the end of experimental treatment the group of students taught Physics through cooperative learning method Student-Team Achievement Division (STAD) shows a significantly higher gain score on the achievement than the group of students taught through the traditional method.

H₄: At the end of experimental treatment the group of students taught Physics through cooperative learning method Group Investigation (GI) shows a significantly higher gain score on the achievement than the group of students taught through the traditional method.

DELIMITATION

The study was delimited to

- Class VII students of two sections of Govt. Model sr. Sec. School, Sector-28, Chandigarh.
- Only four units selected from Physics syllabus of Class VII for instructional treatment as prescribed by NCERT, New Delhi.
- Students-Team Achievement Division (STAD) method of cooperative learning.
- Group Investigation (GI) method of cooperative learning.
DESIGN OF THE STUDY

In the present study pre-test, post-test group control quasi experimental design was employed with purposive sample in the form of intact sections of class VII of the same school. It involved three groups of students, two experimental groups and one control group. The experimental group-I was taught Physics through cooperative learning method (STAD) and the control group was taught the same content through conventional method. Whereas experimental group-II was taught Physics through cooperative learning method (GI). The designed comprised of three stages. The first stage of the study involved testing of students achievement of all three groups. The second stage involved experimental treatment. The experimental treatment consisted of teaching four units of VIIth grade Physics through cooperative learning methods i.e. STAD method to experimental group-I and GI method to experimental group-II and through conventional method to control group. In third stage the students of all three groups were post-tested on achievement in Physics.

SAMPLE

Sampling is a technique by which a relatively small number of individuals or measures of individuals, objects or events are selected and analysed in order to find out something about the entire population from which it is selected. Sampling technique reduces the expenditure, saves time and energy, permits measurement of greater scope or produces greater precision and accuracy.

In all types of researches, there are some inferences regarding a well specified and identifiable group known as population and the selected number of persons or objects is known as sample. Sample is the representative proportion of the population.

The sample of the present study comprised of 120 pupils studying in two sections of the seventh grade of Govt. Model Sr. Sec. School, Sector 28D, Chandigarh. One group of 40 students formed the control group whereas 40 students formed the experimental group-I and remaining 40 students formed the experimental group-II.
TOOLS USED

For the present investigation the following tools were used:

A  Standardised Tests
2. Socio-Economic Status Scale (Singh, Radhey Shyam and Kumar)

B  Self Developed Tool
1. Achievement Test (developed by investigator)
2. Cooperative Learning Lesson Plans (developed by the investigator)
3. Worksheets(STAD)(developed by the investigator)
4. Worksheets(GI) (developed by the investigator)
5. Formative Tests (developed by the investigator)

PROCEDURE

Procedure of the experiment comprised of two main stages, which are selection of the sample and conducting the experiment.

Stage 1: Selection of the sample:

The sample of the present study comprised of 120 pupils studying in two sections of the seventh grade of Govt. Model Sr. Sec. School, Sector 28D, Chandigarh. One group of 40 students formed the control group whereas 40 students formed the experimental group-I and remaining 40 students formed the experimental group-II.

Stage 2 : Conducting the Experiment

The experiment was conducted in three phases as given below :

Phase 1 : Administration of Pre-test
Phase 2 : Conducting the Instructional programme; and
Phase 3 : Administration of Post-test
Phase I: Administration of Pre-test:

Three pre-tests, i.e., S.E.S., Intelligence, Achievement Test in Physics, were administered to the students of three groups by the researcher herself. The instructions pertaining to the tests were explained verbally in clear terms to the students before administering the test. The administration of these tests was carried out as per norms and instructions contained in their manuals.

Phase II: Conducting the Instructional programme

To find out the efficacy of the treatment variables, the instructional treatment was manipulated in the form of teacher-directed instruction followed by cooperative learning settings.

The instructional treatment was given for 60 days which included 20 lessons and ten formative tests to the experimental group-I (STAD group). The experimental group II (GI) was given instructional treatment for same 60 days which included 20 lessons, 10 presentations and 10 worksheets whereas the control group was taught by the traditional method. Same content was taught to all the three groups. Two effective cooperative learning methods called Student Team-Achievement Divisions (STAD) and Group Investigation (GI) were used.

Phase III: Administration of the Post-Test

Immediately after the instructional treatment was over, the subjects were assessed on criterion measure to know the effect of the treatment.

Achievement Test in Physics was administered to both the experimental groups and the control group.

STATISTICAL ANALYSIS

The following statistical techniques were employed, to analyse the data obtained from the experiment to test the hypotheses.

1. Descriptive statistics such as means and SDs were worked out on the score of achievement.
2. Analysis of variance (ANOVA) was used, in order to adjust pupils intelligence and socio-economic status.

3. (ANOVA) was employed for testing the significance of difference among the means of pupils achievement in Physics.

FINDINGS

i) The results arrived at during this study show that the post-test achievement mean scores of the experimental group-I and control group, matching on their intelligence and socio-economic status, differ significantly in favour of the experimental group.

ii) The post-test achievement mean scores of the experimental group-II and control group, matching on their intelligence and socio-economic status, differ significantly in favour of the experimental group.

This implies that the students who are taught Physics through Students-Team Achievement Divisions (STAD) under Cooperative Learning i.e. experimental group-I and students who are taught Physics through Group Investigation under Cooperative Learning i.e. experimental group-II, both show significant improvement in their achievement in this subject than the students who received instruction through the traditional method (i.e. the control group). It suggests that both Students-Team Achievement Divisions (STAD) and Group Investigation methods of cooperative learning contributes towards raising the achievement of students in Physics by its implication in the subjects as well.

iii) The group of students taught Physics through Students-Team Achievement Divisions (STAD) i.e. experimental group-I and students taught Physics through Group Investigation i.e. experimental group-II, both show significantly higher mean gain in achievement than the group of students taught Physics through traditional method (i.e. the control group).
STAD and GI under cooperative learning develop more cohesive relations with their classmates than the students who learn through traditional method of teachings.

CONCLUSIONS

It may be safely concluded from the above findings that STAD and GI under cooperative learning significantly improves the scores of students of the experimental group in their Achievement.

The conclusion of the study need also to be expressed in terms of their global importance for educational purposes vis-a-vis the tested hypothesis of the study.

Prima-facie, the principal focus of the study addresses the four basic postulates of the learning process and its impact on education for sustainable development of each and every individual learner in a school situation which is deemed to be a miniature society in itself, watching individually as well as collectively, the interest of its every member in terms of all round unfoldment of their potentials and personality traits benefiting a wholesome citizenry. The fourfold fundamental variables of the study obviously include: (a) the learning method, especially the cooperative learning method; (b) the learning outcomes, in terms of performance achievement; as the principal human characteristic that goes a long way in value inculcation such as self-confidence or self-worth germane to the strength of human behaviour and character formation, the underlying ultimate goal of education per se.

The retention of all the four hypotheses of the study namely H₁, At the end of experimental treatment the group of students taught Physics through STAD under cooperative learning scores significantly higher on the achievement test than the group of students taught through the traditional method; H₂ At the end of experimental treatment the group of students taught Physics through GI under cooperative learning scores significantly higher on the achievement test than the group of students taught through the traditional method; H₃ ; At the end of experimental treatment group of students taught Physics through under cooperative learning method STAD shows a significantly higher gain score on the achievement test than the group of students taught through the traditional method. H₄; At the end of experimental treatment group of students taught Physics through under cooperative learning method GI shows a significantly higher gain score on the achievement test
than the group of students taught through the traditional method does prove the superiority of the cooperative learning method over the traditional classroom teaching processes, which indeed has been the growing demand of the fast changing educational scenario today, making schooling a playful endeavour for all practical purposes of sustainable development and joyful learning, especially at the elementary school level. The results of the study do not, in any way, discard or under estimate the importance of individualized learning techniques, nor was it the objective of the study, but it only shows that the method of cooperative learning is much more crucial to the inculcation of values of cooperative living and healthy cooperation rather than the dry bones of sheer competition that narrows down the process of education to self-directed individualized learning. Quite significantly, both healthy cooperation as well as healthy competition complement and supplement each other in making the learning process tangible to sustainable human development. Therefore, both of them are obligatory in their own right to an effective schooling.

**EDUCATIONAL IMPLICATIONS**

The present research clearly shows that changing from a traditional competitive classroom to a cooperative one does not diminish student achievement; it significantly improves achievement. In the present research, groups were rewarded based on their members learning and also students were individually accountable for their academic performance. Thus a positive effect on students’ achievement in Physics was found to be there to suggest the usefulness of cooperative learning for improving students’ achievement.

There may remain many unanswered questions in a piece of research, but the main to be commended here its to say that cooperative learning proves to be more tangible in its effectiveness on achievement. Cooperative learning proves to be practical and widely acceptable to students. When students are not able to understand teacher's explanation, group members are able to explain in simpler words that are more easily understood. In this way, it improves students perception about learning and decreases the feeling of alienation. Also that students attain comparably on
achievement which shows that cooperative learning reduces individual differences and enables all types of students to perform better.

• Cooperative learning can be used as a supplement to large group classroom teaching. It is easier to monitor 12 or 13 students in groups than 55 or 60 individuals in class.

• Cooperative learning suggests a new role of teacher. A teacher, accustomed to being the sole source of information for teaching the passive learners in the classroom has to change to be a facilitator in the learning process to actively encourage the student to:
  - help each other and learn from each other.
  - participate in discussions
  - facilitate each others' learning.
  - engage in problem solving in a free democratic way.

• The teacher should closely monitor the involvement of all kinds students especially the achieving students in their learning activities.

• Teachers need to structure the lessons and curriculum cooperatively.

• The study has important implications for teacher education. Given the current widespread use of cooperative learning at all levels, it is imperative that pre-service teachers understand how to structure and monitor meaningful learning experiences for students.

• Cooperative learning sessions would include games, recreational activities like solving puzzles and riddles, holding group discussions on some general topic related to current affairs to create more interest among students. Ultimately, the participants of cooperative learning sessions or the members of the group begin to take control of their own learning.

• Group tasks designed and communicated to students in ways that make them believe that they are linked in such a way that one cannot succeed unless everyone succeeds. The tasks should engage students more actively in their learning experiences.
• The topics in different subjects to be taught by cooperative learning should be so decided that they should require use of skills that students feel capable of using to maximize their involvement in tasks.

• Even the less structured subjects like language, arts can be taught with this method like the problem-solving topics (grammar, comprehension, compositions, maps).

• Important skills such as critical thinking, creative problem solving and the synthesis of knowledge can easily be accomplished through cooperative group activities in the inclusive classroom.

• Meaningful content in cooperative lessons is critical for the success of all students. For students to succeed within their groups, careful consideration regarding group heterogeneity must be in conjunction with roles that ensure active and equal participation.

• Students in heterogeneous classroom team to solve complex cognitive tasks and the progress of the lower achieving students does not occur at the expense of the higher achievers or vice versa. So cooperative learning is recommended for fostering students reasoning and communication.

The results and conclusions reached during the course of this study clearly highlight the effectiveness of cooperative learning in raising the students cognitive and effective achievement. These findings certainly have a number of important implications for teachers, teacher-educators, curriculum makers and planners and for the society at large.
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