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UNDERSTANDING STUDENTS' OPINION ON CO-OPERATIVE LEARNING IMPLEMENTATION IN MATHEMATICS

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Abstract:
The study seeks to understand students' opinion about implementation of co-operative learning approach. An experiment on co-operative learning approach was conducted on 78 students of standard IX studying in schools affiliated to the SSC Board and with English as the medium of instruction. It has used one tool, namely, Co-operative Learning Implementation Opinionnaire. It was found that on the whole, students are substantially satisfied with the implementation of co-operative learning approach. It was found that there is a gradual improvement in average group performance measured using a rubric in terms of (a) involvement in decision-making, (b) extent of social interaction, (c) involvement in group contribution, (d) tenacious behaviour and (e) group structure and operations over a period of 16 class periods. Students have also expressed several strengths and a few weaknesses of co-operative learning approach when data were analysed qualitatively. Some of the strengths of the co-operative learning approach that emerged from the qualitative data analysis include five categories, namely, (a) Social and Academic Support, (b) Learning to Take Up Roles and Responsibility, (c) Importance of Affective Qualities, (d) Pleasurable Experience and (e) Active Classroom. Similarly, the four major categories of weaknesses of the co-operative learning approach that emerged from the qualitative data analysis include (a) Negative Impact of Interdependence, (b) Unsuitability for Mathematics, (c) Lack of Confidence and (d) Indiscipline.

Keywords: co-operative learning approach, co-operative learning implementation, group performance rubric, qualitative data analysis

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1. Introduction

An abundant amount of research has been conducted comparing the relative effects of co-operative, competitive and individualistic efforts on instructional outcomes. Co-operation is a structure of interaction designed to facilitate the accomplishment of a specific end product or goal through people working together in groups.

Co-operative learning is an approach to teaching and learning where students of mixed levels of ability are organised into groups and rewarded (in terms of a star or a grade) according to the group's accomplishment, instead of the accomplishment of an individual student. Co-operative learning is an instructional approach that at once focuses on learning academic and social skill by students. It is reported to be decidedly successful in the classroom due to its increasing emphasis on interdependence amongst students, providing students with the learning material and worksheets to learn effectively from each other. The academic and social skill goals are clearly stated at the beginning of a class and students work towards fulfilling the same.

Slavin (1994) conducted research on a form of co-operative learning he described as Student Team Learning. Slavin suggested that co-operative learning has the potential to capitalise on "*the developmental characteristics of adolescents in order to harness their peer orientation, enthusiasm, activity, and craving for independence within a safe structure.*" Slavin explained that there are various methods for implementing co-operative learning techniques into classes of all subject areas and grade levels; however, the underlying feature is that all students to work together and be responsible for each other's learning. Through his review of the literature on co-operative learning, Slavin identified the following three concepts that are fundamental to all co-operative learning/Student Team Learning techniques:

- Students are rewarded as a team but are graded individually.
- The team's success is not conditionally based on individual performance of one student. All students must help each other to achieve learning goals.
- All students are expected to improve based on their own previous performance, thus ensuring all students are challenged to do their best.

Co-operative learning is perhaps a response towards the intense competitive and individualistic nature of learning in the Indian context.

2. Review of Related Literature

Bassett (1991) conducted a qualitative case study of three teachers with reference to classroom implementation of co-operative learning. The focus of the study was to find

out *"What, from a teacher's point of view, happens when co-operative learning methods are implemented?"* and *"What happens to a co-operative learning model when it is implemented by trained teachers?"* Case studies of these three early elementary teachers were conducted based on data collected over eight months with the help of participant observation and unstructured interviews. The case studies provided an account of the teachers and a narrative description of a co-operative lesson conducted by the teachers. The remainder of each case study was organised around four major categories emerging from the data: (1) configuration, (2) problems, (3) implementation and (4) teacher thinking. A cross-case analysis followed the case studies and included summaries, conclusions and recommendations related to teacher education, implementation and further research. The study found that (i) Classroom configuration and the training model differed in social skill instruction, group processing and the use of group contingencies. (ii) A four-step model is suggested for teachers learning to use co-operative groups. (iii) Problems specifically related to the use of co-operative groups were seen as less important than other problems. (iv) The resolution of grouping issues is an important part of implementation. (v) None of the three teachers received support as they sought to implement co- operative learning. Neither the principal nor colleagues' support groups provided any formal or informal support to the teachers even though this sort of support was expected at two of the schools. (http://digitalcommons.andrews.edu/cgi/viewcontent.cgi?article=1216&context=dissertations).
The first finding of this study implies that it is essential to study students' opinions about the implementation of co-operative learning as well as group performance through rubrics in the Indian context as the classroom conditions differ in Indian schools. Quinn (2006) investigated into the effects of co-operative learning on student motivation, attendance and achievement in a school age GED programme's science lessons. The research used a pre-test; post-test method to study the effects of co-operative learning on motivation, achievement and student attendance. It was found that students showed improved motivation and higher achievement after implementation of co-operative learning.

Robinson's (2012) study revealed that study participants perceived the training sessions and actual implementation of co-operative learning to be overall positive experiences. They also revealed that challenges existed with implementing co-operative learning. Kristiawan (2013) in their descriptive qualitative study found that the strengths of co-operative learning include a) having advantages in terms of delivery material by using a complete infrastructure, b) English teacher create learning that inspires students to be active, c) the students become subject of the study, d) had quite good and e) teacher becomes a facilitator. On the other hand, weaknesses are a) the

learning process is still using the conventional model, b) English language usage not maximum, c) the process of learning tends to lead the achievement of curriculum and d) contextual, teachers are still following the situation and condition of students. Ying (2015) studied Chinese students' perceptions of co-operative learning in Finland. The study found that all the 10 participants regarded co-operative learning as beneficial and invaluable in enlightening and expanding their minds, promoting motivation in learning, deepening their understanding and promoting socialization despite several weaknesses including misunderstandings caused by cultural differences, low efficiency and time conflicts. When faced with conflicts or disagreements, they tended to be non-confrontational and compromised whereas for the academic or language barriers, almost all participants tried to be active and sought for help directly. Lucena & San Jose (2016) found that students interact and express themselves more to their peers or classmates during instructional process through co-operative learning. The approach provided an opportunity to reluctant and fearful students to share their ideas and opinions regarding the concepts discussed in the class. This helped in strengthening their self-esteem because they knew that they were accountable to the performance of the group in the class.

Several meta-analytic studies have been conducted on the effects of co-operative learning on academic achievement (Johnson & Johnson, 1989; Slavin, 1994; Johnson et al, 1998; Springer et al, 1999; Bowen, 2000; Johnson et al, 2000 & Roseth et al 2008). These cover Preschool until adult education (all disciplines), Elementary and secondary students, College students (18 years or older), Undergraduates in SMET courses, High school and college chemistry courses, Kindergarten to adult education and Middle-school, ages 12–15, (all disciplines). These studies reported an effect size ranging between 0.18 to 1.04.

3. Need of the Study

A large number of studies have been conducted on the effect of co-operative learning approach on academic achievement, mathematics anxiety and attitude of students towards mathematics. Prior research has found that co-operative learning enhances students' attitude towards learning. In the Indian context co-operative learning model was found to be more effective for students with mastery goals (which are a part of incremental theory of intelligence) whereas the traditional lecture method is found to be more effective for students with performance goals (which are a part of entity theory of intelligence) (Pandya, 2011). However, very little prior work on co-operative learning has focused on students' understanding of the co-operative learning approach. Very

little prior research in the Indian context has attempted to understand students' opinion on the overall implementation of the co-operative learning approach as well as its strengths and weaknesses. This forms the basis of the present research.

The class size in Indian urban schools is sometimes as large as 80 students or sometimes more and thus, implementing co-operative learning is a challenge for the teachers. Hence, the findings about the effectiveness of co-operative learning approach in the Western, developed countries may not hold in the Indian context. This necessitates that research is conducted to ascertain (i) the extent of students' satisfaction with the implementation of the co-operative learning approach, (ii) the strengths and weaknesses of the co-operative learning approach and (iii) the nature of group performance over a period of twenty-two periods as measured by a grading system through the use of a rubric.

4. Aim of the Study

The broad aim of the research was to understand students' opinion on the overall implementation of the co-operative learning approach.

4.1 Research Questions

1. How satisfied are the students about implementation of the co-operative learning approach?
2. What is the level of group performance over a period of twenty two periods as measured by a grading system through the use of a rubric?
3. What are the strengths and weaknesses of the co-operative learning approach?

5. Method

The present study focuses on measuring the extent of satisfaction of students' with the implementation of the co-operative learning approach as well as understanding the strengths and weaknesses of the co-operative learning approach. For this purpose, the exploratory survey method was used. This survey led to both quantitative and qualitative data. The researcher has manipulated the method of teaching to ascertain its effect on students' academic achievement in mathematics. Hence the methodology selected is the quasi-experimental one. After the experiment, students' responses to the implementation of the co-operative learning approach as well as their scores on group performance measured using a rubric were obtained.

5.1 Intervention Programme

In the present research, the researcher developed an instructional programme based on Co-operative Learning Model. In the present research, instructional programme on chapters on linear equations in two variables, graphs, ratio and statistics was developed. The techniques used under Co-operative Learning Model in the present investigation included Jigsaw Technique and Think-Pair-Share. The researcher obtained permission from a selected school for implementing the intervention programme. The researcher first administered the pre-test on Students' Mathematics Achievement Test the experimental group. After the pre-test, the experimental group was taught using the Co-operative Learning Model. At the end of this, the post-test on Mathematics Achievement Test and Co-operative Learning Implementation Opinionnaire were administered on the students and data were analysed using statistical techniques and analytical induction. The researcher has used this design as it was the most feasible one and the interpretation of the results has been cautiously done. The students of standard IX were taught selected topics in Mathematics subject. The treatment was given on the basis of content from the text books prescribed by Maharashtra state text book production and curriculum research, Pune. In the experimental group, the researcher taught the content matter using the Co-operative Learning Model. Twenty two periods from the school time table were taken up to teach the content. It was spread over twelve working days. Five days per week were taken up for three weeks, teaching one to two school periods a day of thirty five minutes duration each. The content was taught in the mornings.

5.2 Participants

In the present research, the sample selected consisted of 78 students – both boys and girls from standard IX of English medium schools situated in Greater Mumbai. The experimental group had 78 students out of which 42 (53.85 %) were boys and 36 were girls (46.15 %). The school selected for the study was affiliated to the SSC Board, Mumbai with English as the medium of instruction. The school was selected randomly using lottery method. However, the experiment was conducted on intact class due to reasons beyond the researcher's control.

5.3 Tools Used in the Study

1. **Co-operative Learning Implementation Opinionnaire**: It is a semi-structured tool having two parts. In the first part, there are 20 Likert-type statements measuring students' opinion towards implementation of co-operative learning. These are structured or closed-ended statements with four response categories

and scoring, namely, 4 = strongly agree, 3 = agree, 2 = disagree and 1 = strongly disagree. Its reliability and validity were established in the Indian context during a pre-pilot study (Cronbach's Alpha = 0.80 and Test-Retest Reliability = 0.78). The second part includes open-ended questions on strengths and weaknesses of co-operative learning as perceived by students.

2. **Rubric for Group Performance**: This included five dimensions namely, Contribution to Decision- Making, Extent of Social Interaction, Contribution to Group Work, On-Task Behaviour and Group Structure and Functioning measured on a four-point scale. On each dimension, the score ranged from 1 to 4 points. It has been adopted from readwritethink.org. The total score on this rubric ranged from 5 to 20 for each group. These five dimensions of the rubric for group performance have been taken from http://www.readwritethink.org/files/resources/lesson_images/lesson95/coop_rubric.pdf and the individual items under each heading have been adapted to suit Indian conditions and mathematics class in particular.

5.4 Techniques of Data Analysis

The study has used the analytical inductive method to analyse the data through descriptive codes. It uses etic categories of strengths and weaknesses of the co-operative learning approach. According to Katz (2001), "*Analytic induction (AI) is a research logic used to collect data, develop analysis, and organize the presentation of research findings*". Besides, students' scores on group performance using a rubric were analysed using graphs.

6. Results

A. Quantitative Data Analysis of Students' Opinion about the Co-operative Learning Approach. This was done by computing the Mean Score of the students on Co-operative Learning Implementation Opinionative. It consisted of 20 items on a four-point scale as follows: SA: Strongly Agree, A: Agree, D: Disagree, SD: Strongly Disagree.

Table 1: Co-Operative Learning Implementation Opinionative

No.	Statement	SA	A	D	SD	Mean
1	Students have to work together in order to learn mathematics successfully.	18	48	9	3	3.13
2	Everybody should work for a common purpose to learn mathematics.	12	51	7	8	2.86
3	All members of the group have to be successful for a group to be successful.	27	32	9	10	2.97
4	Group members should help each other learn in order to make up for deficiencies.	31	29	9	11	3.21
5	Along with getting good marks in the examination, the group also teaches us to help each other.	30	35	8	5	3.15
6	The group also teaches us to make effective presentations in the class.	35	28	7	8	3.15
7	Working in the group reduces my tension regarding mathematics learning.	28	32	10	9	3.06
8	I enjoy learning mathematics in group rather than learning it in regular class.	35	32	9	3	3.30
9	In order to be successful, the team is required to be successful.	21	39	10	8	3.06
10	Even if an individual is not successful, the team members support him/her for the team success.	29	29	12	8	3.01
11	The student is kept active in this process.	31	28	10	9	3.17
12	Teams give us the opportunity to repeat the same topics in different forms and activities.	29	28	11	8	2.99
13	Students have the opportunity to learn from each other.	27	35	10	6	3.19
14	Learning in group enhances our sense of responsibility because of the role given to each member from the beginning to the end.	28	32	9	9	3.26
15	Group learning makes us aware that if a member does not fulfill their role, the group will be affected unfavorably.	25	38	11	4	3.21
16	Students are inclined to fulfill their responsibility in a timely manner so that the team does not face any problem.	28	32	11	7	3.17
17	Group learning enables us to make use of expected skills at maximum level.	35	26	8	9	3.26
18	It enables us to seek help from other team members when we are faced with a difficult topic or problem.	30	28	10	8	3.15
19	It enables us to develop leadership skills.	26	40	7	5	3.24
20	It provides us to develop teaching skills especially in the expert group studies and group sharing.	27	32	9	10	3.03
21	Because the team members do the teaching, the other team members' learning depends on the effectiveness of the teaching.	28	32	7	11	3.12
22	It has a positive impact on my communication and social skills.	28	38	7	5	3.35
23	I find myself more enthusiastic about learning when using group learning as opposed to using individualized seat work.	32	30	9	7	3.26

The Mean score on students' responses on the Co-operative Learning Implementation Opinionnaire was computed and was found to be Mean = 61.28. The criterion used for interpreting this score is as follows:

Score	**20-32**	**33-44**	**45-56**	**57-68**	**69-80**
Interpretation	Very Poor	Fair	Satisfactory	Substantially Satisfactory	Very High

Conclusion: Students are substantially satisfied with the implementation of the co-operative learning approach. On the basis of students' scores on these statements, it was observed that on three statements' students' scores were below 3. These are statement numbers 2, 3 and 12.

These statements imply that efforts need to be made to ensure that (i) everybody worked for a common purpose to learn mathematics, (ii) all members of the group are successful for a group to be successful and (iii) opportunity need to be given to the treatment to repeat the same topics in different forms and activities.

B. Analysis of Group Performance: This was measured using a Rubric for Group Performance and analysed using a line graph.

It is essential to mention here that group performance of students was measured after Period 1, Period 6, Period 11, Period 16 and Period 22. However, the scores for all the groups did not change after Period 16 and thus could not be shown graphically. Hence all the graphs here show data for Period 1, Period 6, Period 11 and Period 16.

a) Involvement in Decision- Making: It refers to the extent of students' participation and contribution to decision-making. The following Figure 1 shows the score of the 15 groups for Period 1, Period 6, Period 11 and Period 16 on decision-making.

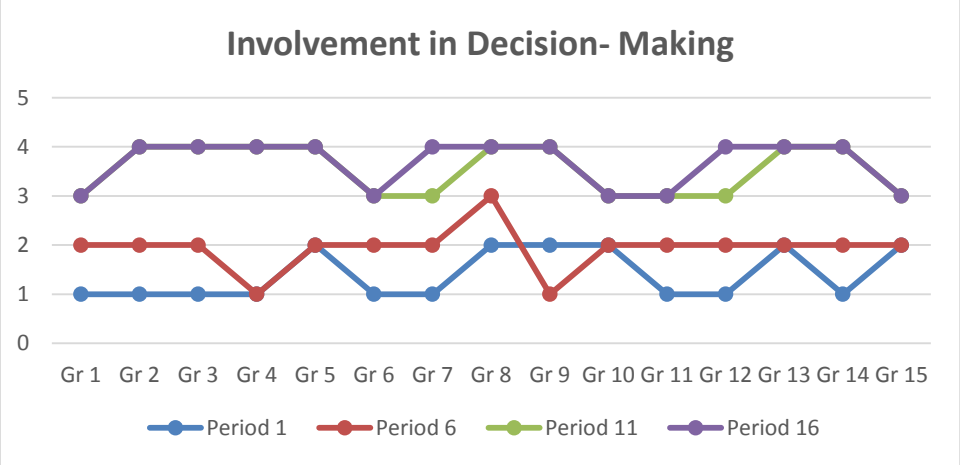

Figure 1

b) Degree of Social Interaction: It refers to the extent of students' respect and encouragement to the views of others, students' asking questions or seeking clarification and building on others' responses. The following Figure 2 shows the score of the 15 groups for Period 1, Period 6, Period 11 and Period 16 on social interaction.

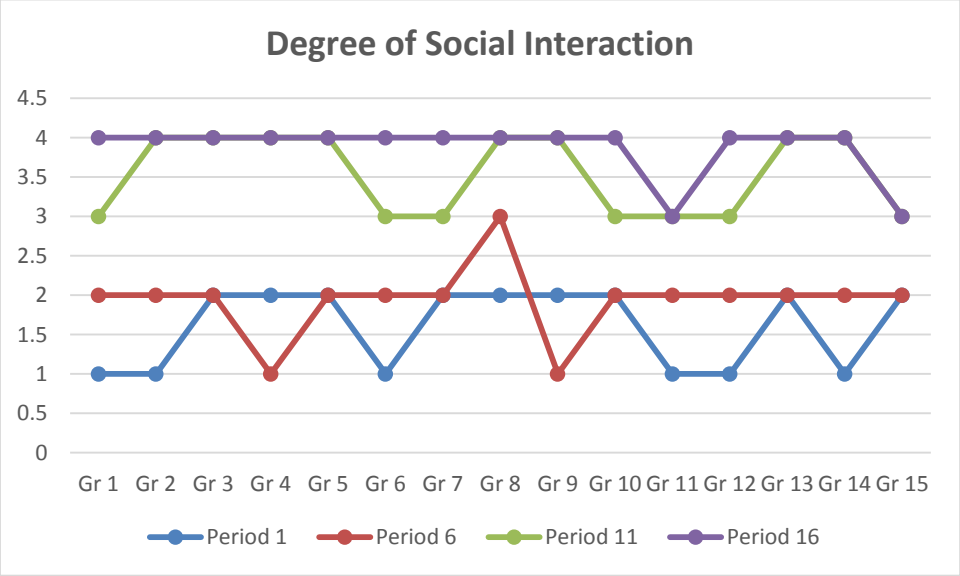

Figure 2

c) Involvement in Group Work: It refers to the extent consistency in student contributing in a positive way to the group work. The following Figure 3 shows the score of the 15 groups for Period 1, Period 6, Period 11 and Period 16 on contribution.

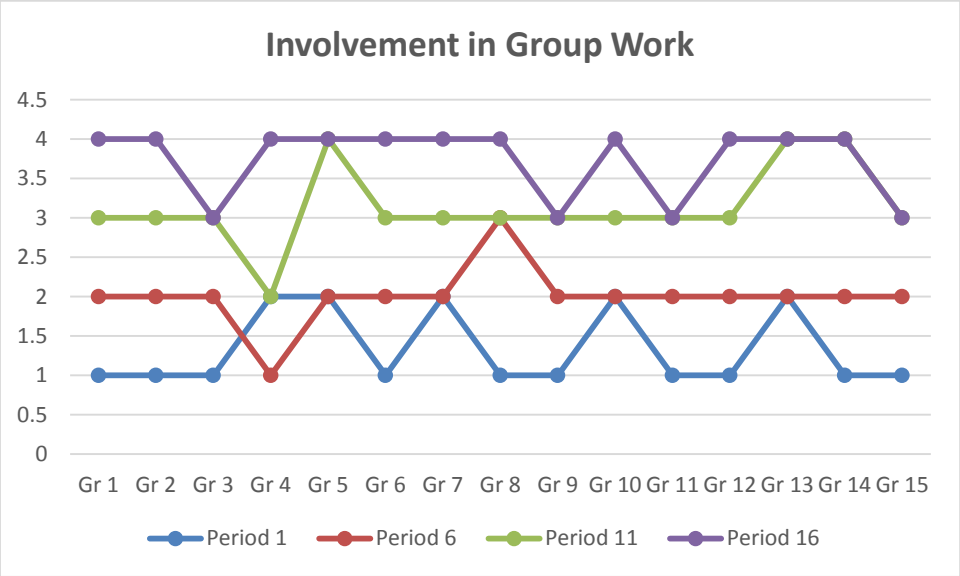

Figure 3

d) Tenacious Behaviour: It refers to the extent of consistency in students exhibiting on-task behaviour. The following Figure 4 shows the score of the 15 groups for Period 1, Period 6, Period 11 and Period 16 on on-task behaviour.

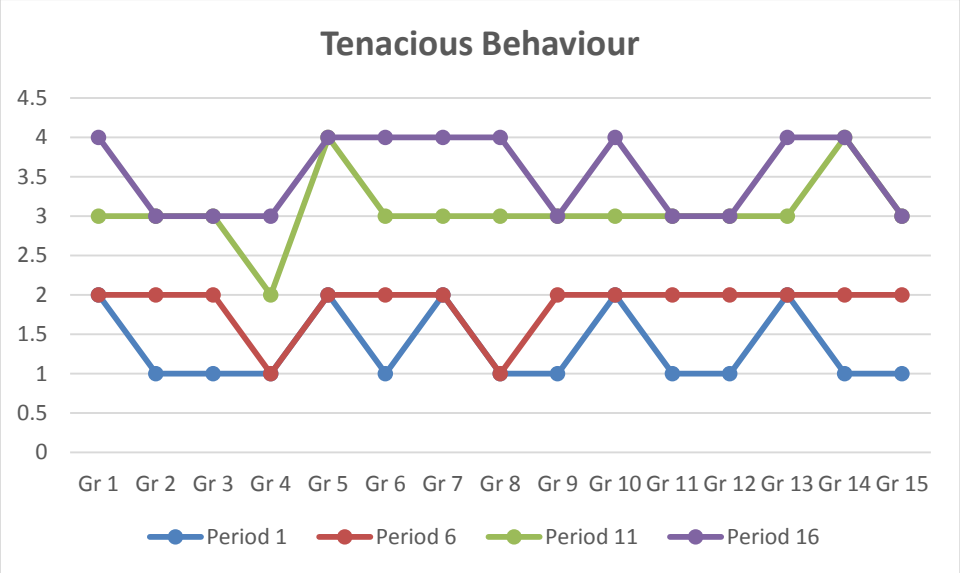

Figure 4

e) Group Structure and Operations: It refers to the extent of students completing a clear and logical sequence of steps, completing task as required and with reflection and revision and members volunteering to take responsibilities and roles. The following Figure 5 shows the score of the 15 groups for Period 1, Period 6, Period 11 and Period 16 on group structure and functioning.

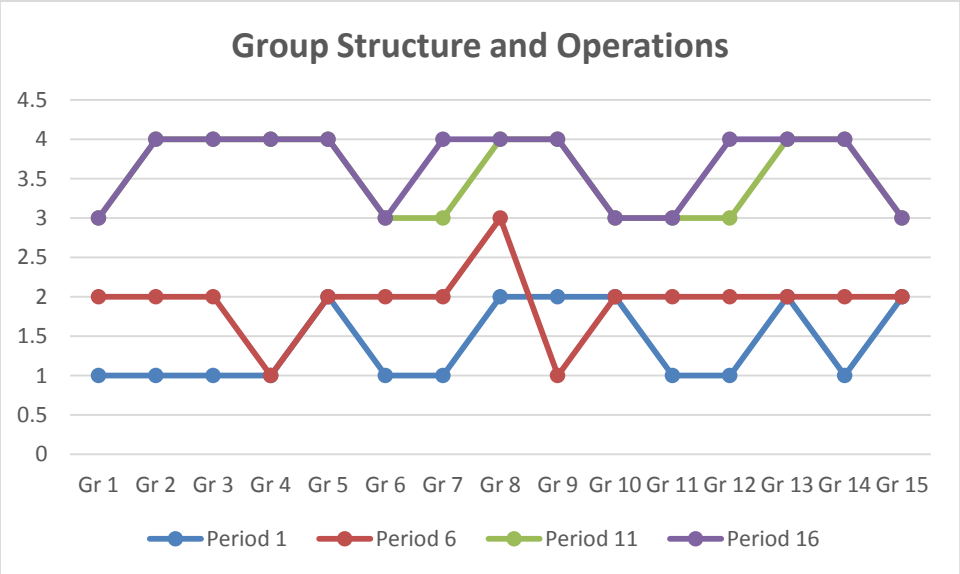

Figure 5

Conclusion: It may be seen from Figures 1 to 5 that there is a gradual change in (a) Involvement in Decision- Making, (b) Degree of Social Interaction, (c) Involvement in Group Work, (d) Tenacious Behaviour and (e) Group Structure and Operations over periods 1 to 16 on all the five dimensions of group performance in all the groups.

Over-all Comparison of Average Group Performance: Figure 6 shows the average group performance on all the five dimensions over a period of Period 1 through Period 16.

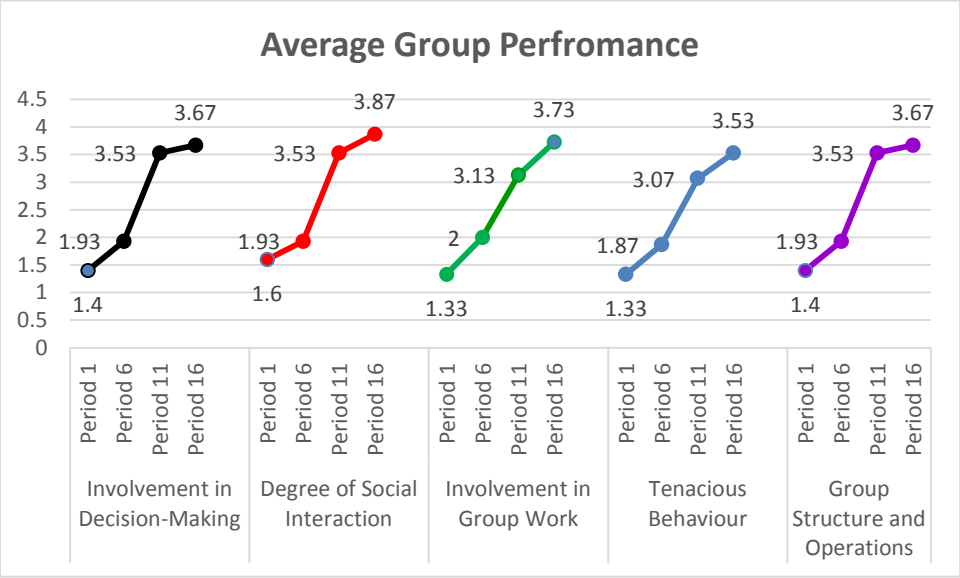

Figure 6

Conclusion: It can be seen from figure 6 that there is a gradual improvement in (a) involvement in decision-making, (b) extent of social interaction, (c) involvement in group contribution, (d) tenacious behaviour and (e) group structure and operations. In the first period, the average performance of all the groups was less than 2, in the sixth period, it was approximately 2, in the eleventh period, it was ranging between 3 and 3.5 and in the sixteenth period, it above 3.5 on all the five dimensions. This implies that students start imbibing the five components of co-operative learning partially from eleventh period onwards and by sixteenth period, imbibe these almost completely.

C. Qualitative Data Analysis of the Strengths and Weaknesses of the Co-operative Learning Approach

Students were asked to indicate the strengths and weaknesses of the co-operative learning approach in their own words.

The following table shows the data and the emerging categories of the strengths the co-operative learning approach.

Table 2: Strengths of the Co-operative Learning Approach

	Strengths	
No.	**Data**	**Categories**
1	We work together and learn, solve problems.	Social and Academic Support
2	We all have to work for a common purpose.	
3	We all have to be successful for a group to be successful. We have learnt to help each other learn so that we can overcome each other's weaknesses.	
4	The group members learnt to support each other so that the whole group can become successful.	
5	We used each other's' skills of giving clarifications, justifying, making ppt., making charts, calculations, making charts etc. so that we make an excellent project.	
6	The bond between group members got stronger. Now I have support of my group members even outside maths class.	
7	I was once absent. The next day, my group members helped me with previous day's learning.	
8	Practice done in groups has improved my maths learning and confidence.	
9	Working in groups helped me to ask questions. We started communicating each other online regarding maths problems.	
10	Learning from the teacher sometimes makes maths more difficult. But I found it easier to learn maths from a friend.	
1	We all had to fulfil our responsibility. I fulfilled mine so that I am not blamed for poor performance of the entire group. Later on, I fulfilled my responsibility because I started enjoying it.	Learning to Take Up Roles and Responsibility
2	We all have to perform some role in the class. We feel that we are also useful and responsible for the success of the entire group.	
3	Some students suddenly take up leadership if other members do not know how to solve a problem and feel that group performance will suffer.	
4	Whenever, I did not fulfil my responsibility, my teacher as well as friends got angry with me.	
5	Our group leader taught us that unitedly we can succeed. She motivated us, directed us when required and made us feel that we were going to be successful.	
1	Earlier, I did not have any friends, I used to just say hello to one or two group members. But later on, I had more opportunities of interaction with other members.	Importance of Affective Qualities
2	The method provides opportunities in transferring information, helping and communicating with each other, reducing tensions regarding maths, making group presentations etc. This way, it makes us feel successful in addition to	

	getting better marks in exams in maths.	
3	Till now, only those students who got good marks/rank-holders got a chance to talk in the class, were praised by teachers and were teacher's favourites because maths is a difficult subject. Now, leaders in the group got more importance in the class.	
4	Earlier, some students were always silent in the class. But I found that many of those became leaders in the group, motivated us to do better in maths, helped us to solve problems, provided suggestions in making ppt. and projects. They are really remarkable. Now I realised that we cannot judge anyone on the basis of their marks alone.	
5	Some of us have emerged as good teachers!	
6	I realised everyone in my group and class has some good quality.	
7	We have the opportunity to learn from each other. It has increased our confidence.	
8	We learn to complete our work on time.	
9	We learnt how to make presentations and justify our work/presentation.	
1	I think studying in a group has helped in me liking maths slightly better.	
2	I feel very happy to help others with maths.	
3	I feel excited about preparing for and making presentations while some others enjoy teaching and explaining.	
4	Till now, I was very scared of maths and disliked it. Now my fear is gone.	
5	I felt that I was the hero of the class when I made our group's ppt. and made presentation and explained questions of the class.	
6	After this, I have started enjoying maths because of group projects, group presentations etc. It has given me new opportunities. Everyone including the teacher appreciated my group's presentation. I felt very happy. Now maths is my favourite subject.	Pleasurable Experience
7	Even if I knew a topic, I got scared when the teacher asked a question in the class and fumbled. But in a group of my classmates, I could answer the questions well. Not only that, I could also help others in solving problems and calculations. This has increased my confidence level. Now I enjoy maths.	
8	We can use the same method in other topics and subjects.	
1	The students remain active in the class. In usual class, we feel sleepy.	
2	We were active at all stages in the class. We studied maths, taught others to solve problems, prepared a presentation and competed with other groups. We learnt maths because we were active.	Active Classroom

Conclusion: The categories emerging from the data indicating the strengths of the co-operative learning approach are (a) Social and Academic Support, (b) Learning to Take Up Roles and Responsibility, (c) Importance of Affective Qualities, (d) Pleasurable Experience and (e) Active Classroom.

The following table shows the data and the emerging categories of the weaknesses the co-operative learning approach.

Table 2: Weaknesses of the Co-operative Learning Approach

	Weaknesses	
No.	**Data**	**Categories**
1	We learn from each other. Some team members can teach well but not all. Thus, some groups did well while others suffered.	Negative Impact of Interdependence
2	The teacher gives grades for the entire group. Thus, even if one of the team members is not good at solving problems, the team cannot get a good grade.	
3	Because, teacher gave grades to the whole group, some students did not participation much in the classroom as they felt that it is not the responsibility of individual students.	
4	A few people do the work and a few don't but all get the same group grades. However, after some time, this situation improved when we were told by the teacher that at the end, each student will get marks on a test depending on his/her performance.	
5	Everyone takes different time to learn a topic. But I still had to work hard so that I don't lag behind others initially.	
1	Maths is a very difficult subject and therefore, I do not think that this is a good method of teaching maths.	Unsuitability for Mathematics
2	We cannot teach as well as our teacher. Hence this method is useful only for teaching easy subjects like languages, that too not English.	
1	I sometimes get scared when my classmate teaches me or explains something to me because he/she is not as experienced as our teacher.	Lack of Confidence
2	Working in groups is sometimes good, but sometimes I can't contribute to the discussions. I get scared of maths.	
3	We are not used to sit in a circle in the class.	
4	Initially, I was scared of asking questions or answering in my group, felt uncomfortable.	
1	It is sometimes difficult to maintain discipline in the class.	Indiscipline
2	Sometimes, discussions are diverted to other topics.	
3	The class sometimes becomes very noisy.	

Conclusion: The categories emerging from the data indicating the strengths of the co-operative learning approach are (a) Negative Impact of Interdependence, (b) Unsuitability for Mathematics, (c) Lack of Confidence and (d) Indiscipline.

In conclusion, it may be said that (a) that there is a gradual improvement in (i) involvement in decision-making, (ii) extent of social interaction, (iii) involvement in group contribution, (iv) tenacious behaviour and (v) group structure and operations. It required about 16 class periods for groups to participate productively in co-operative learning. This long period could have arisen possibly due to the large class size of 78 students. It needs to be probed further whether any student background or presage characteristics influence their participation in co-operative learning effectively. (b) students are **substantially satisfied** with the co-operative learning approach in spite of the large class size and (c) there are several strengths of this approach such as the strengths of the co-operative learning approach are (i) Social and Academic Support, (ii) Learning to Take Up Roles and Responsibility, (iii) Importance of Affective Qualities, (iv) Pleasurable Experience and (v) Active Classroom and a few weaknesses of this approach such as (i) Negative Impact of Interdependence, (ii) Unsuitability for Mathematics, (iii) Lack of Confidence and (iv) Indiscipline.

Implications for Teachers and Teacher Education: When a teacher attempts to implement this approach in the mathematics class, he/she need to keep in mind the weaknesses of the approach and make possible efforts to reduce/eliminate the same. While implementing co-operative learning, teachers should form groups and also rotate students in the group so that none of the groups suffers on account of differential ability of students to explain concepts to their peers. Teachers should also ensure their active support while the class is going on. Teachers also need to ensure that all students participate in class activities by providing emotional and academic support to students and creating a non-threatening environment in the class. Grades should be given to the group by taking the average of the performance of all the members so that all students feel responsible for group performance. Efforts to reduce mathematics anxiety of students need to be made so that they feel comfortable with the application of co-operative learning approach in mathematics. Gate-keepers in the group need to be trained to ensure that students do not discuss topics unrelated to the subject-matter at hand. Besides, teachers need at least 16 class periods for effective implementation for ensuring students' participation in decision-making, affirming effective social interaction, contribution to group work, on-task behaviour and group structure and functioning. Teacher education programmes could also incorporate these suggestions in planning teacher training in co-operative learning.

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