



Impact of Collaborative Learning on Academic Achievement in Mathematics of Secondary Students in the School Hostel in Rural Area in India

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Author's contribution

The sole author designed, analyzed and interpreted and prepared the manuscript.

Article Information

DOI: 10.9734/BJESBS/2016/19819

Editor(s):

(1) Stan Weeber, Professor of Sociology, McNeese State University in Lake Charles, Louisiana, USA.

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Complete Peer review History: <http://sciencedomain.org/review-history/12693>

Short Research Article

Received 29th June 2015
Accepted 25th August 2015
Published 16th December 2015

ABSTRACT

Collaborative learning is basically known as a teaching arrangement such as small, heterogeneous groups of students work jointly to achieve a certain goal. Students or peers are encouraged and supported themselves, mentally they are aware that the responsibilities are themselves, they employ group related social skills and evaluate their own progress. The common things are positive interdependence, equal opportunities and individual accountability. So, it implies that collaborative learning groups in schools would be used as a logical teaching method. The main objective of this paper to determine the effect collaborative learning towards achievement in mathematics and also the attitude towards collaborative learning of mathematics among the hostel students of class nine in secondary school. The eighteen (18) hostel students were take part in the 8-week studies. The first 4-weeks they studied in their usual traditional way for and for the next 4-weeks in collaborative. In result there had significant difference in their academic achievement. Also from survey and field notes it can be concluded that collaborative learning had an effective positive attitude on student academic achievement in the classroom.

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Keywords: Collaborative learning; attitude; academic achievement.

1. BACKGROUND

Collaborative learning is such a way of instruction where small groups of students work jointly to enhance their own knowledge and share knowledge with other peers [1]. Students in an ideal collaborative learning setting are expected to do cooperation among them as they encourage each other to do home assignments, work together regardless of their gender, academic ability, cast and whether they are normal or disabled. Johnson and Johnson's study [2] stated that students in a collaborative learning setting should celebrate each others' learning.

According to [3] there was a controversy in against of group learning. The finding was that an individual works alone and receiving of an individual is little better, than group working. However, this finding of research studies does not support this belief. But Johnson and Johnson's study [4] shows that group working is better. In their study of group working, it established for the 140 students who participated in their study. Group working was successful because students' achievements increased as a group and in some individual achievements. Their recommendation was that group exams for group grades from the bases of collaborative learning strategies implemented in higher education classrooms be further researched [3]. Muniz and Walmsley [5] two very important aspects of implementing collaborative learning are to provide group rewards and to reinforce individual accountability.

Zakaria and Iksan [6] believed that collaborative learning is the bases in the belief that learning is most effective when students are actively involved in sharing ideas and working collaboratively to complete academic assignments. Jenkins and O'Connor [7] studied that learning disabled students and regular students can contribute to collaborative learning in reading and make develop in reading. Ability grouping, has a long standard practice in reading instruction, it also has been criticized for lowering self-esteem and motivation among students with reading problems, and it often spread the gap between high and low achievers [8,9]. However, Jenkins, Laurence, Wayne, and Vadasy [10] concluded that there are three most benefits self-esteem, security that comes from being pairing among peers and higher success rates and/or

better achievements. Also, peer tutoring has repeatedly been focused that it is an effective method of teaching reading to students with and without disabilities [9]. Mathes and Fuchs' meta-analysis [11] found that students with disabilities made greater gains in reading when they served as tutors, another study by [12] found no difference between whether students with disabilities served as tutor or tutee.

According to Jenkins and O'Connor [7], collaborative learning in the classroom is one of the best strategies for teaching students with and without disabilities in the classroom. The successful of teaching through collaborative learning is the resultant most of all studies. The method of collaborative learning is associated with increased mental activity in relational and emotional memory connections and long-term memorization [13]. In collaborative learning, low achieving students made contributions among a group of peers and achieve success and all participating students increased their understanding of skills and ideas by explaining them to peers [9]. Collaborative learning activities may be time consuming along with the enormous amount of pressure from standardized test scores and the overwhelming curriculum, some veteran teachers are pulling away from collaborative learning activities.

Thompson and Taymans [14] elaborated that in order for collaborative learning to be successful, teachers need to be sure that they do the following: Have clear system for managing student behavior, teach students specific interpersonal skills and teach students how to perform the specific rules and procedures expected within different collaborative structures.

In this study I have taken a secondary school located in rural area of Midnapore District, West-Bengal, India. The scores on mathematics in the last academic session i.e., in eighth grade showed that 79% of students achieved less than 60% marks.

Firstly the author used traditional way to learn their mathematics learning, which means students get freedom to work independently as they did earlier and received help from teacher when needed. But, researcher felt there needed to use practical and simple interventions to enhance student achievement in mathematics and motivate towards learning. The objective of

this study to evaluate (determine) the effectiveness of collaborative learning on academic achievement in mathematics and effectiveness on motivating of the students to learn mathematics.

1.1 Research Questions

1. Are there any effects of collaborative learning on achievement of nine graded math students?
2. Is collaborative learning an effective teaching strategy to motivate mathematics students to achieving mathematics?

1.2 Definition of Concepts

1.2.1 Collaborative learning

Collaborative learning is a method of learning where small groups of students work jointly to improve their own and each other are learning. It is group learning activity arranged in such a way that learning is based on the socially structured share of knowledge between learners in groups in which each learner is held accountable for his or her own learning and is motivated to increase the learning of others.

1.2.2 Academic achievement

Operationally academic achievement refers to achievement in subject. This is to the marks obtained in the subject. It includes excellence in sporting, behavior, confidence, communication skills, art, culture and the like. Academic achievement has become an educational touchstone since the passage of the Right to Education Act in 2009, (RTE-09) in India declared that no child will left behind the education up to their 14 years age, this is their right to take education from the country with free of cost. For that requiring all educators - including school counselors - to formally define how their jobs and programs impact students' academic growth and contribute to overall school success.

2. RESEARCH METHODOLOGY

2.1 Participants

The students who were participated in this study was ninth graders ($N = 18$) students who are staying in the school hostel in a rural area of Midnapore District, West-Bengal, India. Out of these 18 students there were 8 male students and 10 female students and their average age is

15 years. As these students are staying in school hostel, there is no scope to take assistance to do their mathematics from others like parents, home tutor etc. The researcher, an experienced mathematics teacher, had a master's degree with teacher education degree. Also, the researcher had 17 years of teaching experience. For this study, the author traced on joint work and jointly thinking in math because students had own ability but casually they did not put the required effort to their learning.

2.2 Intervention

An objective of this paper was to improve in academic achievement, to learn joyfully, to work jointly and to think jointly about the mathematical problems. The researcher wanted to properly utilize the teacher's professional activities that have been acquired in their teacher training programme and in other Educational Specialist Program to make students' learning a meaningful process to ensure student achievement. The experiment took place over an 8 week period. For the first 4 weeks, traditional instruction was given to students. Students solved their problems alone without peers help. Then for the next 4 weeks, participants are studied in pairs. Students with greater math ability were paired with students who had less ability in success. Ethically collaborative learning as follows: peers assume the role as teachers, peers must be polite and students must ask peers for help before involving the teacher. Students must work problems individually and seek help from partner if needed and to check work, and partners must learn a new task then teach their partner. Students had received whole group instruction and were assigned group projects or skills where they had to depend on each other for the answer to problems. Another technique was Think Pair Share (TPS) where students share their knowledge with their partner.

2.3 Data Collection Techniques

For this study the data were collected mainly from two areas- Students' achievement and students' attitudes toward collaborative learning. Student Questionnaire (see Appendix A) determined students' opinions about working with partners. An observation sheet was used to record students' observations towards the attitudes of collaborative learning. A checklist was used to establish the presence of on-task behavior and participation of the students during the class activities.

2.4 Student Achievement

In this study students' were given a pretest and posttest. These results were analyzed and studied to compare students' achievement with and without collaborative learning way. Students were evaluated using an observation sheet (see Appendix B). The use of this sheet was to study their feelings, whether they felt that they learned more or easier using collaborative learning and whether they wanted to participate, enjoyed lessons or disliked collaborative learning. On the questionnaire sheet there were ten questions about collaborative learning in respect of mathematics. Students had the option to respond by answering yes, no, or sometimes. Their responses were studied and analyzed to conclude the students' attitudes towards collaborative learning.

In data collection method, this state academic session is start from January to December, researcher applied this experiment in the month of October-November of 2014. The observation sheet (see Appendix B) was filled twice weekly for 15 minutes to look for the following: are students engaged with their task, are students working jointly, to observe their motivation and observe whether they are engaged with positive or negative attitudes. All records were collected and used to study, whether students were motivated to learn and their attitudes toward collaborative learning.

The objective of this study was to determine the effectiveness of collaborative learning on students' achievement in mathematics. Results of the study are based on the researcher's analysis of the following: Students' achievement scores on a math pretest and posttest, student survey (Appendix A) and observation sheet (Appendix B).

3. RESULTS

Using the simple statistical methods means and standard deviations on this studies are given in

Table 2. According to the table it is clear that mean score before collaborative learning ($M = 66.38$) was significantly different [$t(17) = -6.87$] from the mean for the students when they were learned through collaborative learning ($M = 86.84$). So safely conclude that in this study that collaborative learning enhances academic achievement in the classroom.

The mean of this students' after the collaborative learning was at about the 98th percentile of the student's scores prior to collaborative learning.

All the students participated in this study filled the observation sheet. Table 2 shows the observation of the participants' from the 10 statements which used in the survey. Every statements' are basically depends on how students feel about collaborative learning to learn mathematics. The researcher wanted to study whether students enjoyed working with peers and collaborative learning motivates their learning.

Results of the collaborative learning survey in Table 2 (statements 3, 4, 6 and 8) reflect that more than 70% of the students agreed that they learn more when they solve mathematics in jointly. Over 60% of the students agreed that they are not interested to do math homework individually. And also 47% of the students said they felt more comfortable with their peers for help rather than teachers help. On the basis of this table score we can safely conclude that students enjoyed jointly work to learn math.

Certainly most of the students were jointly tried to learn and its shows that those students' were motivated to learn jointly. Some of they were motivated that appreciated about working with jointly. Among them there were five students (64% in Table 2, question no. 10) that the researcher enjoyed listening to them to as worked problems every day, the facial expressions and excitement in their voices made the researcher feelings that collaborative learning was the key factor to them for learning.

Table 1. Comparisons of mean scores

	Traditional learning		collaborative learning		difference	Comparison of means		
	M	SD	M	SD		M	T	P=0.05
Collaborative learning	66.38	10.90	86.84	9.35	20.46	-6.87	2.11	1.74

Table 2. Collaborative learning attitudes survey

	Statement	Sometimes	Yes	No
1	I like to do mathematics.	25%	45%	30%
2	Some time I take help when doing math homework away from school.	35%	52%	13%
3	I like to solve mathematics alone.	47%	3%	50%
4	I don't like to study math in-groups.	42%	5%	53%
5	I do solve mathematical problems in my peer group for helping rather than my teacher.	30%	47%	23%
6	I learn mathematics less when working in-groups.	15%	0%	85%
7	I dislike mathematics,	22%	19%	59%
8	I like to do my math homework alone.	22%	14%	64%
9	I think solving mathematics is fun and enjoyable.	36%	36%	28%
10	I learn more when we work in groups in our math class.	36%	64%	0%

4. DISCUSSION AND CONCLUSION

The study of collaborative learning showed an increase of 20.46 points on the means of the student posttest scores when compared to their scores on the pretest, indicating that the use of collaborative learning was significant.

After studied all data on the students' observation sheets, the researcher can safely conclude that students enjoyed working jointly in groups and supposed to be more motivated to want to learn in collaborative way. So the students' also motivated to learn mathematics.

5. LIMITATIONS AND IMPLICATIONS

The author is very restricted him to do this work within a school. As the author wish to implement this type of work in large sample with standardized tools. On the basis of the results, the author wish to use collaborative learning instruction in the future to improve among student's participation and motivation in their academic achievement. Also researcher has intention to measure effectiveness of collaborative study in mathematics through fuzzy measure [15]. The researcher confident that this type of experiment could be applied for a large sample and sure that collaborative learning would improve students' academic achievements.

ACKNOWLEDGEMENTS

The author is very much grateful to all the reviewers for their constructive suggestion for improvement this paper.

COMPETING INTERESTS

Author has declared that no competing interests exist.

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APPENDIX A

Survey/Questionnaire

Please do not write your name on the paper

The purpose of this survey is to find out how you feel about collaborative learning.

Directions: Read each statement.

1. If you agree with the statement put tick (√) mark corresponding that box.
2. If you disagree with the statement put tick (√) mark corresponding that box.
3. If you are not sure, or if you sometimes agree or sometimes disagree with the statement put tick (√) mark corresponding that box.

Note-This survey will not affect your grade. Please be honest in your responses.

	Yes	No	Some times
1. I like to do mathematics.			
2. Some time I take help when doing math homework away from school.			
3. I like to solve mathematics alone.			
4. I don't like to study math in-groups.			
5. I do solve mathematical problems in my peer group for helping rather than my teacher.			
6. I learn mathematics less when working in-groups.			
7. I dislike mathematics,			
8. I like to do my math homework alone.			
9. I think solving mathematics is fun and enjoyable.			
10. I learn more when we work in groups in our math class.			

APPENDIX B

Field notes observation log

Date: _____

Student Name/Number	Participation	Attitude	Student comments	Teacher comments

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Peer-review history:
 The peer review history for this paper can be accessed here:
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