



Impact of Collaborative Learning Approach on Secondary Students' Achievement in Chemistry

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Abstract: Chemistry is a subject of diverse terminologies, formulas, nomenclatures, reactions which is practically a burden for student. This fear and anxiety of students towards chemistry is due to scientific illiteracy, unequipped teachers, traditional teaching methods, lack of exposures to real life experiences, unavailability of laboratories etc. But this gap can be bridged through an effective transaction of subject. Here comes the term "COLLABORATION". In Collaborative learning, the students work together to explore and inquire something assessing each other's progress. In the present study, 30 Secondary students of a Secondary Government School are selected as sample and pre-tested with the achievement test. The scores are noted. Then the students are taught Chemistry with three types of Collaborative learning strategies viz; Group Investigation, Jigsaw Method and Think-Pair-Share. Then the students are post-tested. Statistical techniques such as Mean, SD, t-ratio are used for data analysis. And the result implies that there is significant difference between the scores of pre-test and post-test i.e. collaborative learning strategy has positive impact towards students' achievement at secondary level. This shows that collaborative classrooms provide better opportunities for students to interact and allows students to learn by themselves. Moreover it helps students to acquire the skills that are suitable to work in group which is vital need of today's world.

Index Terms - Collaborative learning, Chemistry, Secondary students, Achievement

INTRODUCTION

Collaboration is a practice of working together for a common purpose to enable the individuals in achieving their targets. It is a co-ordinated effort of all involved in a certain work. Putting the heads and hands together, all people work together to accomplish a common goal. According to Gokhale (1995), individuals are able to achieve higher levels of learning and retain more information when they work in group rather than individually. "Collaborative learning is an umbrella term which involves the joint intellectual efforts of teachers or students or teachers and students together. It doesn't develop higher level thinking skills in students, but boosts their confidence and practical knowledge. Here the students are engaged to learn from each other's resources, skills and experiences and evaluate their progress. Knowledge is created and shared within the students. Lev Vygotsky's concept of "ZPD" (Zone of Proximal Development) has brought the idea of Collaborative learning. There are certain areas in learning where the learners can learn but with the help of guidance or assistance. ZPD gives that assistive guidance and skills to the learners during the process of maturation. This idea has made the way for collaborative learning. Chemistry is one of the diverse subjects. It is an interesting and important subject full of definitions, concepts, facts, laws and reactions which is difficult to understand. Science educators, teachers, parents and other stakeholders had noticed the poor performance of students in Chemistry during Secondary stage of schooling and also further. Chemistry is a human endeavor and it deals with some traits like logic, reasoning, insights, discovery, invention, enthusiasm, curiosity. But most students fear chemistry and consider it to be very difficult. This may be due to the abstract nature of chemistry and traditional teaching methodology. Hence collaboration is important for Chemistry not just because it is a better way to learn but to equip the

students for problem-solving, discovery, exploration, invention, innovation and lifelong learning. Indian society, including the present educational system, is mainly based on competition. It is also found in teacher education system and hence perspective teachers need to be productive and efficient collaborator. Hence it needs to be ingrained during pre-service training (U Borkar, 2012). The underlying premise of collaborative is based on concept building through cooperation by group members, in contrast to competition among them (M Laal, 2012). Collaborative learning environments encourage students to interact and inquire which ensures higher levels of participation. To create a dynamic and effective collaborative framework, they employed the Jigsaw and Simulation strategies. Simultaneously they incorporated some activities which support the social dimension of learning in an authentic context. In the study, they found that students are particularly suitable for problem solving when provided with appropriate simulated and collaborative context (Bouta et al., 2013). The use of online collaborative assignments between two flipped organic chemistry classrooms, one in Canada and the other in the United States, was examined for impact on learners (D Skagen and all, 2018). The study aimed at exploring the connection between the use of group task and group cohesiveness. It is very crucial because the nature of learner's success is largely determined by the values of cooperation, interaction and understanding of the subject (K Anwar, 2016). Student learning and course performance are often improved when students actively engage with the content. However, pedagogical practices that foster active engagement often rely on student-student and student-instructor interactions that may be difficult to adapt to an online environment (P M Gemmel and all, 2020)

CONCEPTUAL FRAMEWORK

Generally collaboration signifies a higher order of co-operative learning which deals with some group tasks and shared activities. Collaborative learning consists of various methods of learning and amongst following three are used for the purpose of present study i.e.

1. Group Investigation
2. Jigsaw Method
3. Think- Pair- Share Method

1) Group Investigation:

It comes from the idea of John Dewey's theory that classrooms should be influenced by democratic society. It opens up students' entry knowledge, beliefs, feelings and attitudes towards the subject. It promotes students' subject knowledge, content mastery, understanding, beliefs, academic skills etc. This method allows the students to work independently and investigate their interest areas.

2) Jigsaw Method:

It is a very effective way of learning in depth. This process involves listening, active engagement and empathy by giving each student the chance to participate in learning. It facilitates interaction among all and leads all students to evaluate each other's contribution.

3) Think-Pair-Share:

This method is applicable for all grade levels. It enhances individual participation in learning first and then sharing of knowledge with each other.

OBJECTIVES OF THE STUDY

1. To study the effectiveness of Collaborative Learning approach on Chemistry achievement of Secondary school students.
2. To study the significant difference between pre-test and post-test scores of achievement in Chemistry.
3. To study the significant difference in post-test scores of achievement between boys and girls students in Chemistry.

HYPOTHESIS OF THE STUDY

1. There exists a significant effect of Collaborative learning on Chemistry achievement.
2. There is no significant difference between the means of pre-test and post- test scores of students in Chemistry achievement test.
3. There is no significant difference in post-test scores between boys and girls on Chemistry achievement.

METHODOLOGY

The present study is an experimental study. According to our research objective, a total number of 30 students were randomly selected from a Secondary Government High School of Mayurbhanj district, Odisha. An achievement test is used as a tool to assess the students' performance. There are 40 objective type question items in the tool which is used to collect data.

Reliability of the test was calculated by Split-half method. The co-efficient of reliability calculated by Spearman Brown formula come out to be 0.76 which is significant at 0.01 level of significance. Hence the tool is reliable.

The tools are checked by the language and subject experts to find out the content validity of the tools. According to expert the tool is valid and appropriate to measure the achievement level of students towards Chemistry.

The data is analyzed with the help of following statistical techniques such as Mean, SD & t-ratio.

DATA ANALYSIS AND INTERPRETATION

TABLE 1:
SIGNIFICANCE DIFFERENCE IN MEAN SCORES OF PRE-TEST AND POST-TEST OF ACHIEVEMENT IN CHEMISTRY AMONG SECONDARY STUDENTS

ACHIEVEMENT TEST	N	MEAN	SDs	SED	t-ratio	Level of significance
Pre-test	30	25.36	7.19	1.53	4.11	Significant
Post-test	30	31.76	4.35			

Table value at .01 level = 2.58 and .05 level = 1.96

It is revealed from the Table 1 and Fig. 1 that the mean scores of pre-test and post-test achievement test among students are 25.36 and 31.76 with SDs 7.19 and 4.35 respectively. The SED came out from the above two tests is 1.53. The t-value is found to be 4.11, which is significant at both 0.01 and 0.05 level. That means there is significant difference between pre-test and post-test on achievement among secondary school students. It suggests that the students have achieved more marks in post-test using collaborative learning than pre-test. Thus, the hypothesis that there is no significant difference between the means of pre-test and post-test scores is rejected.

The mean scores of pre-test and post-test achievement in Chemistry among Secondary school students as depicted in Table-1 is represented in 3D bar.

Fig.-1

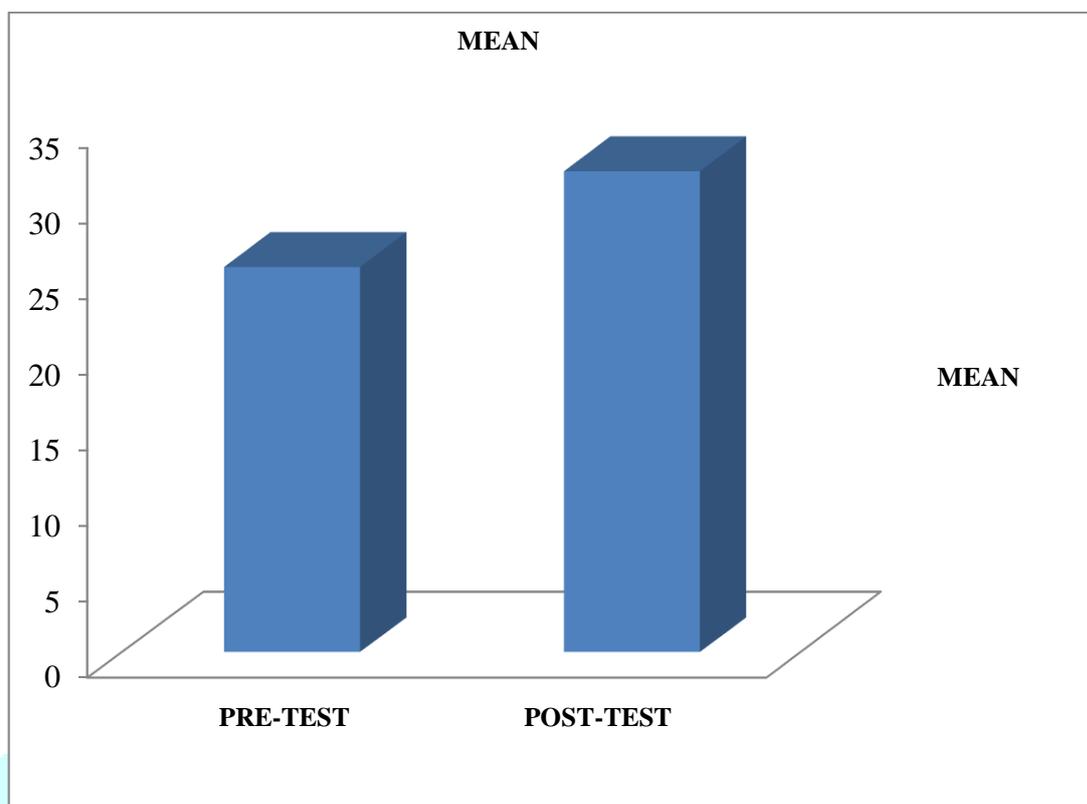


TABLE-2

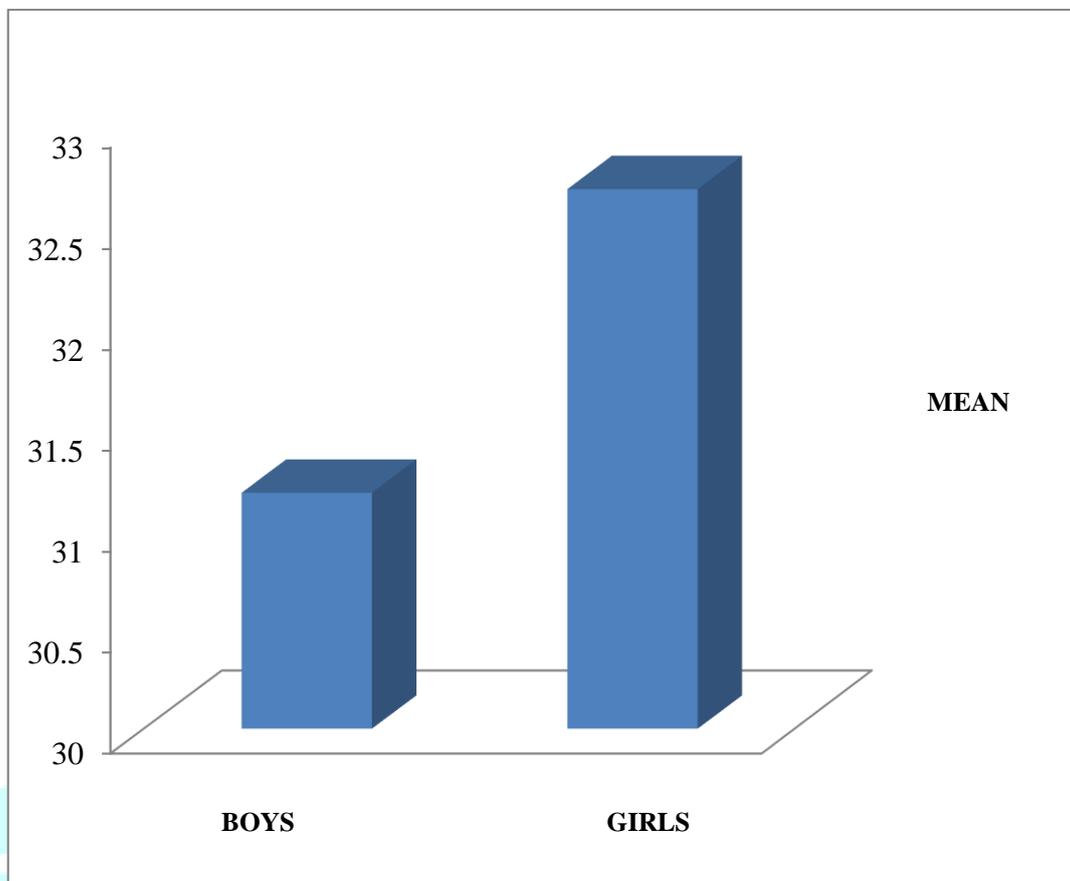
SIGNIFICANCE OF DIFFERENCE BETWEEN BOYS AND GIRLS IN ACHIEVEMENT OF CHEMISTRY IN SECONDARY SCHOOL STUDENTS

GROUPS	N	MEAN	SDs	SED	t-ratio	Level of significance
BOYS	18	31.17	4.75	1.65	0.91	Not significant
GIRLS	12	32.67	4.18			

Table value at 0.05 level=1.96 and 0.01 level = 2.58

It is revealed from the Table-2 that the mean of boys and girls in achievement test are 31.17 and 32.67 with SDs are 4.75 and 4.18 respectively. The SED came out from both the groups is 1.65. The t-value is found to be 0.91, which is not significant at both 0.01 and 0.05 level. That means there is no significant difference between boys and girls on achievement among higher secondary school students. Thus, the hypothesis -3, there is no significant difference between post-test scores of achievement in Chemistry between boys and girls is accepted. The mean scores of boys and girls achievement in science among higher secondary school students as depicted in Table-2 is represented in 3D bar.

Fig-2



FINDINGS OF THE STUDY

Scores of post-test is higher than pre-test scores in Chemistry. This shows that collaborative classrooms provide better opportunities for students to interact and allows students to learn by themselves. Moreover it helps students to acquire the skills that are suitable to work in group which is vital need of today's world which is isolating in segments due to various reasons like technological advancements, nuclear families and value erosion. Family members and peers hardly have time to interact with each other due to time crisis. Thus a gap in learning discussing, expressing and sharing is created. Collaborative classrooms fill that gap.

CONCLUSION

Collaborative learning is one of the most widespread and fruitful areas of theory, research, and practice in education. Hence, there is a need to create a positive environment around the learners, enabling learning from others, imparting as well as imbibing the value of positive interdependence from very young age. It is clear from the study that collaborative learning technique is very important for Chemistry. It helps in the easy transaction of knowledge, information, ideas and sharing too. It makes the presentation of lesson effective and improves students' critical and analytical thinking.

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