

EFFECT OF COLLABORATIVE LEARNING ON ACADEMIC ACHIEVEMENT IN RELATION TO INTELLIGENCE

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Abstract

The study examined the effect of collaborative learning on academic achievement in relation to intelligence. The pretest posttest control group design was chosen. There was an experimental group and a control group. Two schools from the Jhajjar district, (Haryana) were randomly selected. From these schools, 35 students were randomly selected at each school. The total sample was 70. The academic achievement test was used as a pre and post test. The intelligence test was used to divide the students into high and low intelligence level. The experimental group was taught through collaborative learning, while the control group was taught through traditional learning. The material was used as modules, designed to implement the collaborative learning methodology during 35 sessions of 40 minutes each. Data were analyzed using mean, standard deviation, t-test, and ANOVA, and 0.05 was the selected significance level. The results of the study revealed that the collaborative learning method was better than the traditional method. High intelligence students performed and improved better than low intelligence students.

Paper Identification



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Introduction

Education provides students/youth with the opportunity to network with others, build relationships with friends, teachers, and students of various ages and cultures, while improving their social skills in class or through extracurricular activities. Students can use this knowledge to comprehend new ideas, form informed judgments, pursue new interests, and succeed in a variety of learning processes. As a result, children become interested in pursuing careers as teachers, doctors, lawyers, investors, and businessmen. They also develop a critical mindset that encourages questioning and problem-solving, which is crucial for fostering children's cognitive development. Teachers can provide students with opportunities each day to recognize the materials they are using, study their properties, and think about how they are alike and distinct from one another. Working together to achieve shared goals is considered collaborative. In collaborative settings, participants aim for outcomes that are advantageous to both themselves and the other group members. In the present study, the researcher is examining if teaching social studies to students through collaborative learning as opposed to the traditional method will result in a difference in improved levels of academic achievement as well as whether students with low and high abilities differ in dependent variable during the teaching process.

Definitions

Collaborative learning: - Collaborative learning is described as "the instructional use of students participating in small groups to maximize both their own and each other's learning" (Johnson et al., 2010)

Academic achievement: - Academic achievement is a "degree to which a student has attained either short-term or long-term educational goals is known as academic achievement" (Kelvin, 2017).

Intelligence: - Intelligence refers to "the capacity to acquire and use knowledge and skills" (Lipi, 2108).

Review of Related Literature

Studies related to Collaborative Learning and Academic Achievement:

Ajaja (2010) looked at the impact of a collaborative learning technique on students' performance in integrated science. The study's key findings were that students in cooperative learning groups carried out significantly better on achievement tests compared to those in traditional classrooms; they additionally did significantly better on attitude tests than those in traditional classrooms. In addition, all students in collaborative learning groups, irrespective of

their level of ability, performed significantly better on achievement tests compared to those in traditional classrooms.

Kumar (2017) examined the impact of collaborative learning on student achievement. An analysis of 28 subjects studies produced an average effect size is 0.26 that was modestly weighted. The examination of effect size moderators utilised a mixed effects model. In both true and quasi designs, the research design had no bearing. To assess the impact of collaborative learning on the variable that is the dependent variable of student achievement, two groups of high collaboration (experimental groups) and no collaboration (control groups) were compared. Analysis of moderator variables, such as grade levels, was either underpowered or negligible.

Kumari and Nayak (2018) explored idea of collaborative learning is especially crucial to attain academic goals with a group of subjects, according to significant research and advocacy in professional literature. Subjects are forbidden from sharing material with or from other subjects while sitting with their backs to the computer, isolating them from one another. The quality of having the social, sentimental, and intellectual abilities and behaviours needed for success as an integral part of society is known as social competence.

Backer, Miller and Timmer (2020) investigated that in three middle level STEM (science, technology, engineering, or maths) classrooms, the effect of collaborative grouping on students' participation. According to research, collaborative grouping improves student learning and builds social and emotional skills that are important for everyday functioning in the modern world. Our results indicate that middle-level classrooms are helped by including collaborative educational tasks when accompanied by intentional group formation, lessons on how to contribute successfully as a collaborative team member, and enriched by reteaching group skills or re-grouping, backed up by proof of student engagement.

Studies related to Intelligence and Academic Achievement:

Malakar and Basu (2017) examined how adolescents with preclinical levels of symptoms of obsessive-compulsive disorder varied from their typical counterparts in terms of general intelligence, cognitive processes, academic achievement, and the link between intelligence and achievement. 110 girls and 100 males were ultimately chosen from a huge group of Bengali eighth graders who were 14 years old. S. According to the research, those with subclinical symptoms showed weaker cognitive functions, lower performance, and a weaker link between intelligence and achievement than those in good health.

Sawhney (2020) found relationship between adolescent academic achievement and effective intelligence. According to the study's findings, there is a positive, weak but highly

significant association between students' academic success and analytical intelligence. Teenagers' successful intelligence and academic accomplishment have a positive, weak, but significant association. The findings suggest that efforts should be focused on the development of analytical intelligence, practical intelligence, and creative intelligence, which when combined will result in the growth of successful intelligence and improve adolescents students' academic performance.

Bottenhorn (2021) investigated although intelligence plays a role in academic achievement; the intelligence quotient (IQ) has a limited ability to predict. During physics-related cognition, IQ was correlated with brain relationship, but connectivity did not mediate the relationship between IQ and performance on tasks. These relationships were sex- and dependent on context, showing that the physics classroom setting and methodology may have a gender impact on students' performance.

Significance of the Study

Many learning opportunities that do not frequently arise in conventional classroom settings were established via collaborative learning. The current study will provide extensive knowledge about the value of collaborative learning and its connection to intelligence. The results of the current study will also aid students to develop their learning abilities (Ajaja, 2010; Backer, Miller, and Timmer, 2020). This study, which intends to examine the benefits of collaborative learning, is significant because it will further the widespread adoption of a learning environment that encourages active engagement, allows students to create their own meaning, and boosts academic performance. All students benefit from the participatory environment that collaborative learning fosters. Research has consistently demonstrated that collaborative learning is successful. In the present study, the researcher is examining whether teaching social science to students collaboratively will make a difference in how well they perform academically as well as whether children of high and low intelligence differ in the dependent variable of academic achievement when learning using various teaching strategies.

Objectives of the Study

- 1) To study the effect of collaborative learning on academic achievement among students.
- 2) To study the effect of intelligence on academic achievement among students.
- 3) To study the interaction effect of collaborative learning and intelligence on academic achievement among students.

Hypotheses of the Study

- 1) There will be no significant effect of collaborative learning on academic achievement among students.
- 2) There will be no significant effect of intelligence on academic achievement among students.
- 3) There will be no significant interaction effect of collaborative learning and intelligence on academic achievement among students.

Design of the Study

To investigate the effect of collaborative learning on academic achievement in relation to intelligence, the study was experimental in nature using a pretest, and posttest and control group design.

Sample of the Study

A sample of 70 students of class 9th from two schools, namely, D.A.V. Public school and S.D. Public School of District Jhajjar (Haryana) was taken. 2 Schools were selected randomly and from these two schools, 35 students were selected randomly in each school.

Tools used for data collection

- Raven's Progressive Matrices (2000).
- Academic Achievement Test (Sharma, 2015).
- Collaborative learning modules (Lessons) prepared by the researcher.

Procedure of data collection

In the first phase, Raven's Progressive Matrices (Intelligence test) were administered in two schools. These scores were used to identify students with low and high level of intelligence.

In the second phase, the academic achievement test was used to measure academic achievement. The scores served as pretest.

In the third phase, the experimental group was taught through collaborative learning in groups. The control group was taught through traditional learning. Each group had 35 social science lessons that were prepared by the researcher himself. Each group was taught for about 35 sessions (40 minutes each).

In the fourth phase, after completing the 35 sessions, the academic achievement test was administered again as a post-test to the students of each group to see the effectiveness of collaborative learning. The answer sheets were scored with the help of scoring keys. The scores of the experimental and control groups were compared on the pre-test and post-test scores to obtain information on the effect of the treatment.

Analysis and interpretation of data

- Descriptive statistical techniques such as mean, and standard deviation were used to see the nature and normality of the data.
- To find out the significance of the difference between means related to different groups and different variables, t ration and ANOVA were used.

Descriptive analysis of the data

The complete analysis for academic achievement variable and groups is shown in the tables:

Table 1 Statistics of Groups at Different Stages on Academic Achievement

Variable	Groups	Pre test (N=35)		Post test (N=35)	
		Mean	SD	Mean	SD
Academic Achievement	EG	27.78	4.40	48.35	6.36
	CG	27.16	4.15	27.53	6.12

Table 1 revealed that at the pre test level, the mean scores of subjects in two groups viz., EG (Collaborative learning) and CG (Control group) varied between 27.78 and 27.16, with maximum difference of .62. This indicated that the subjects in two groups scored similarly, in term of academic achievement. The range of SD was 0.25. At the post test level, the subjects in EG (Collaborative learning) had the highest mean score of 48.35 while the subjects in CG (Control group) had the lowest mean score of 27.53. The mean score of subjects in the experimental group increased by 20.82 in EG (Collaborative learning) indicated an improvement in academic achievement outcome, after the effect of intervention treatment.

To analyze the dependent variables, tests of between-subjects effects were studied. The following table 2 showed the F ratios for dependent variable.

Table 2 Tests of Between- Subject Effects

Source	Dependent Variable	Df	Mean Square	F	Sig.
Groups (Collaborative learning)	Academic Achievement	2	462.147	72.311	.000 (2.61E-20)
Intelligence	Academic Achievement	1	54.911	45.163	0.005
Collaborative Learning and Intelligence	Academic Achievement	2	335.155	61.722	0.001

In Table 2, It has been found that the F ratio was statistically significant for academic performance with $F=72.311$, $p = .000$ ($2.61E-20$). It clearly indicated that there was a statistically significant difference between the average gain scores of two groups taught through different approaches (collaborative learning and conventional learning) on academic achievement. Therefore, the academic achievement of the subjects has been significantly improved due to the treatment.

Further, it has been found that the F ratio was statistically significant for the academic achievement w.r.t. intelligence with $F = 54.911$, $p = 0.005$. It clearly indicated that there was a statistically significant difference between mean gain scores of high intelligence and low intelligence on academic achievement.

Furthermore, the F ratio was found to be statistically significant for academic performance w.r.t. intelligence with $F = 54.911$, $p = 0.005$. It clearly indicated that there was a statistically significant difference between high intelligence and low intelligence gain mean scores in academic achievement.

In addition, it has been found that the F relationship was statistically significant for academic performance with $F = 61.772$, $p = .001$. It clearly indicated that there was a statistically significant interaction between the average gain scores of two groups taught through different approaches (collaborative learning and conventional learning) and intelligence groups (high and low intelligence) on academic achievement.

Table 3 Comparisons of two groups on academic achievement

Dependent Variable	Groups (I) N=35	Groups (J) N=35	Mean Difference (I-J)	Std. Error	Sig.
Academic Achievement	Collaborative Group (EG) Mean= 22.67	Control Group (CG) Mean=2.47	20.21	0.756	.000 (7.38E-41)

In Table 3, there was a mean difference of 20.21 between the mean gain scores of the EG (collaborative learning) and the CG (control group) scores in academic achievement, the standard error was 0.756, which was statistically significant at a significance level of 0.05 with $p = .000$ ($7.38E-41$). It indicated that EG (collaborative learning) performed better than CG (traditional learning) on academic achievement.

Table 4 comparisons Intelligence groups (High & Low Intelligence) on Academic Achievement

Dependent Variable	Intelligence (I) N=35	Intelligence (J) N=35	Mean Difference (I-J)	Std. Error	Sig.
Academic Achievement	High Mean=18.84	Low Mean=8.84	10.00	.016	.004

In Table 4, there was a mean difference of 10.00 between the mean gain scores of the high intelligence students and the scores of the low intelligence students in academic achievement; it was found that the standard error was .016, which was statistically significant at the 0.05 significance level with $p = .004$. This indicated that students with high intelligence performed better than students with low intelligence in academic achievement.

Findings and Conclusion of the Study

- a) It has been found that the collaborative learning strategy is significantly related to the academic achievement of the students of the experimental group. This shows that collaboration was effective in improving student academic achievement.
- b) In the intelligence groups (high and low intelligence level), a significant difference was found in the mean scores of students with a high intelligence level and students with a low intelligence level in the academic achievement of the pre-test to post test. This indicates that high-intelligence students have performed and improved better than low-intelligence students in academic achievement after intervention treatment.
- c) The interaction effect of instructional strategy (collaborative learning) and intelligence level (high and low intelligence level) yielded a significant difference in academic achievement. The students, in the experimental group and in the intelligence level groups, differed significantly from pre-test to post-test.

Educational implications

- a) It was found that the interventional treatment, that is, the collaborative learning used in the present study, is effective in improving the academic achievement of students. Therefore, this strategy can be included in the curriculum as it would be beneficial for students in the classroom.

- b) Collaborative learning should be used to improve the quality of education at college and school level.
- c) High intelligence students performed better than low intelligence students when using collaborative learning, therefore, this strategy should be implemented for students with high intellectual ability and would be beneficial for them.

Recommendations for further Research

- a) The effect of collaborative learning can be seen in other variables such as anxiety and problem solving in different age groups.
- b) The present investigation was restricted to a single classification variable (intelligence). The study can be carried out on other variables, such as achievement motivation, social economic status and classroom climate, etc.
- c) The research can be replicated to explore the effectiveness of collaborative learning in disadvantaged groups, such as low-achieving, backward and mentally retarded learners.
- d) The present study has been conducted only in the Jhajjar district of Haryana. The study may be extended to other districts in Haryana and other states in India.

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