

EFFECT OF INFORMAL COOPERATIVE LEARNING STRATEGY IN BIOLOGY ACHIEVEMENT ON LEARNERS OF DIVERSE ABILITY

Sangeeta Yaduvanshi

Faculty of Education, Banaras Hindu University, Varanasi – 221005 (UP), India
sangeetayaduvanshi@gmail.com

Associate Professor Dr. Sunita Singh (**Corresponding Author**)

Faculty of Education, Banaras Hindu University, Varanasi – 221005 (UP), India
sunitasingh.bhu04@gmail.com

ABSTRACT

The present study explored the effect of Informal cooperative learning on performance of lower, average and higher achievers ninth grade Biology students. An experimental research design with equivalent group was used. A school was purposively selected and two groups were formed by random distribution of students in two groups. The groups were equated on the basis of intelligence and previous academic achievement scores. The sample consisted of 62 participants out of them 30 students constitute the experimental group and was taught using cooperative learning strategy (CLS) while 32 students comprises the control group taught using traditional teaching methods. Pre- and post-tests were used to collect data. Data were analysed using inferential statistics: independent student t-test and analysis of covariance (ANCOVA). The results of the present study showed that the experimental group outperformed to control group suggesting that CLS enhanced performance of lower, average and high achievers more than the traditional teaching approach.

Keywords: Student, achiever, Biology achievement test (BAT), cooperative learning, cognitive domains

INTRODUCTION

Cooperative learning has emerged as a new approach to classroom teaching in recent years. The approach is now accepted and preferred instructional procedure at all the levels of education in most of the western countries. Mostly used and widely accepted definition of cooperative learning is proposed by Johnson and Johnson (1999), they defined “cooperative learning is the instructional use of small groups in which students works together to maximize their own and each other’s learning.” It is group learning activity organized in such a way that learning is dependent on the socially structured exchange of information between learners in group. It is a teaching strategy in which students work cooperatively in small groups in order to enhance their own and their peers’ learning (Abrami, Poulsen & Champer, 2004). The method of cooperative learning is characterized by the positive dependence to accomplish shared learning goal, engagement in face-to-face promotive interactions, equal involvement and definite roles, to develop appropriate collaborative and interpersonal skills and assess the effectiveness of group functioning for future learning (Johnson & Johnson, 1999; Kagan, 1994). Thus, cooperative learning is not simply a synonym for students working in groups. Any group activity cannot be considered as cooperative learning until and unless it comprises five essential elements that are positive interdependence, individual accountability, face-to-face promotive interaction, collaborative skills and group processing skills (Johnson et al., 1998). It is a theoretically validated teaching strategy in which small teams, each with students of different levels of ability, use a variety of learning activities to improve their understanding of a subject. Many of research studies pointed out the benefits CLS on students’ learning, academic achievement, social relationships, motivation, and self-esteem (Johnson & Johnson, 2009; Johnson, Johnson, Roseth, & Shin, 2014; Slavin, 2014).

In Indian context it is commonly observed that the classes are overdriven by “teacher talk” and teaching-learning process is predominantly text-book and examination oriented. Here, teacher serves as pipelines for source of knowledge and seek to transfer their knowledge and idea to passive students. They emphasize learning about answers more than an exploration of questions; promote rote memory at the cost of critical thinking process, learning of segments of knowledge alternate to understanding in context, reading in lieu of doing (Sridevi, 2008, Yaduvanshi & Singh, 2015). This type of instructional method does not allow for active participation and interaction of students in the teaching-learning process. This creates monotony in the classroom and students’ lost their interest in the subject. The classrooms are generally overcrowded and single teacher has to deal with large number of students. Here teacher found very less opportunity to give individual attention to all students. As a result the gap between poor and good student increases. Since, secondary education is a keystone of the education system. This stage is crucial for deciding future career outlook of students. Student’s performance in science subject predicts whether they should pursue their career in STEM or not. Generally the STEM related subjects are considered for high achievers and average and lower achievers are suggested to drop these subjects at higher secondary level. But, the objective of science education is not only

prepare the students as future scientific professions but also a mean to develop the ability of reasoning ability, inquisitiveness, creativity, reflective thinking, positive attitude and problem solving approach (NCF, 2005). These abilities and skills enable the present generation learner to face the challenges of the contemporary technological based society of 21st century. Hence, it is call of time to ensure accessibility and availability of quality science education to all. Therefore, for preparing students of today to become successful individuals of the tomorrow, teacher needs to ensure that their teaching should be effective. So, it is call of time to revisit our pedagogical practices. Cooperative learning created many learning opportunities that do not typically occur in traditional classrooms. Siti Rahayah (1998) suggested that science teachers need to use cooperative learning activities in order to enhance scientific skills and to increase achievement in science. Incorporation of cooperative learning as an alternative pedagogy in conventional science classroom is one of imperative need of modern time for making teaching-learning process more effective so that quality science education must be available and accessible for all types of students, and only to those who are good performer in science or considered as “science type” (Tanner et al., 2003). Thus, incorporation of informal cooperative learning strategies (CLS) in the classroom may seem helpful for preparing our students for successfully meet the challenges fast growing emerging scientific and technologically based society.

Many of the research studies on different discipline and different grade reported that cooperative learning has positive effect on the achievement of students. Finding of Al-Badawi (2005) and Liao (2005) also shows that this strategy has positive effect on achievement in English. Kosar (2003) investigated the impact of cooperative learning and traditional methods of teaching in social studies. Both of them concluded the supremacy of cooperative learning strategy over traditional methods of teaching. Iqbal, M. (2004), Gubbad, (2010), Muhammad, Z. (2010) & Nayak, R.K. (2011) research studies indicated that there was a statistically significant relationship between mathematics achievement and cooperative learning. Yager (1985), Miller (1992) Bowen (2000) and Arbab (2003) respectively found that cooperative learning strategy had positive effect on achievement in science. Pandey and Kishore (2003) investigated that cooperative learning strategy had effective than traditional only at knowledge level but had no significant effect at comprehension level. Most of these researches in the science were based on physical science topics and conducted on elementary levels. Studies conducted by Muraya and Kimamo (2011), Achor, Wude, Duguryil (2013) and Nnorom, (2015) also revealed that cooperative learning strategy has positive effect on Biology learning. Many of researches had been carried out in abroad regarding the effectiveness of cooperative learning on students’ performance. Slavin (1991) in his meta analysis report reveal that 61% researches on cooperative learning indicated that it enhances students performance in comparison to traditional method in all main subjects, at all standard and in all diverse ability of high, average, and low achievers students. In an experimental study Kenneth and Young (1999) found that cooperative learning had no significant effect on achievement of higher achiever pre-service teachers. Likewise, Armstrong (1999) also reported that cooperative learning had slightly raised the performance of gifted students of heterogeneous group in comparison homogenous groups of gifted students. Similar, results were reported by Majoka, Saeed and Mahmood (2007) they studied on secondary school mathematics students and found STAD had no significant effect on high achievers but had significant effect on low achievers students. Thus, the study concluded that structured cooperative learning strategy is more favourable for low achievers than high achievers. Contrary to these findings of Singhanayok and Hooper (1998) and Khan (2012) showed that cooperative learning had significantly increases the academic achievement of high as well as low achiever students in science and English respectively in elementary level students. Similarly Gemechu and Abebe (2017) investigated the effect STAD method (highly structured CLS) on ninth grade students’ achievement on mathematics and, demonstrated that STAD method is effective than traditional methods and it significantly increases the academic performances of lower and higher achiever students. In the study carried out by Numprasert (2006) showed that students’ academic achievement scores in course BG 1202 - Science, Man, and his environment were significantly improved in higher, middle and low achiever of cooperative learning group as compared to their counterpart taught with the traditional lecture method. In contrast to findings of Numprasert (2006) and Buchs et al., (2015) research results indicated that highly structured cooperative learning had positive effect on the understanding of average-ability students on targeted task while the low and high achievers had the similar progression in experimental and control group, whereas average achievers progressed more in the highly structured condition. Analysis of the above literature revealed that almost all study suggested that CLS has positive effect on lower achievers, some of them also advocated that cooperative learning enhance the performance of high achiever or gifted and some are inconclusive regarding the significant increase in achievement of higher achievers and very little literature is available on the impact of cooperative learning on the achievement of average students. Since, maximum population of the normal classroom are belongs to the category of average performer therefore it is also important to explore the effect CLS on average achievers. Most of experiment was carried out in abroad and in most of studies structured CLS/ STAD methods were used. There is dearth of study on biological science no study had been conducted on Informal CLS and its effect diverse group of learner in Indian culture. Therefore, researcher conducted the present study to find out the

effect of informal CLS on the academic achievement of lower, average or higher achiever students of Biology at secondary level.

METHODOLOGY

An experimental design was used in present study, where school was chosen purposefully according to the need and convenience of the investigator. Researcher employed pre-test – post-test equivalent group to find out impact of informal CLS on students' achievement. The two groups were equated on the basis intelligence test scores and pretest scores. No significant difference was found in both of these tests.

SAMPLE OF THE STUDY

The total sample of 62 students was taken for the study. The students were randomly divided into two groups; experimental group comprises of 30 students taught by the Informal cooperative learning and control group which is taught by traditional lecture –cum -demonstration method. Students were categories into higher, lower and average achievers on the basis of their two successive test scores in science in previous standard.

INSTRUMENTS OF DATA COLLECTION

To fulfil the objectives of the present study, the following instruments were constructed and used to collect the relevant data:

I. BAT: Biology Achievement Test (BAT) was developed by the researcher consisting of 100 items of knowledge, understanding and applying levels of the cognitive domain of blooms taxonomy. It was validated by experts of test and measurement and three experienced Biology teachers for face and content validity. The reliability coefficient of test was calculated by using the Kuder-Richardson formula 20 and Cronbach coefficient (split half method of reliability) method, the values were found 0.67 and 0.838 respectively.

II. Layout plans on Informal CLS :The layout plans deals with the theme of organization in living world and cover four units of Class IX NCERT (National Council of Education Research and Training) science textbook include units; Cell: The fundamental unit of life, tissue, diversity in living organisms, why do we fall ill? The plans included instructional objectives, a list of materials needed, group size, assignment to roles, and arrangement of the room. The layout plans are based on Jigsaw of CLS.

III. Opinionnaire to assess the perception of students' in cooperative learning: A opinionnaire of 15 items was prepared to assess the perception of students towards cooperative learning.

EXPERIMENTATION

After the pre-test, the whole experimental group was subjected for orientation for cooperative learning for 3 days. Then treatment was Informal CLS was given investigators used different type Informal cooperative learning techniques like think- pair share, three step interview, robin round table and then gradually shifted towards Jigsaw methods of CLS. In Jigsaw CLS, the topics to be study were segmented in sub topics and member of each group was assigned a particular subtopic to learn. All members sharing the same sub topic were met together into expert groups where they discussed their content so as to master and become experts. They finally reconvened where each member explained his unit to other members of his/her group or some times to whole class as designed in lesson plan by researcher. Parallel to treatment of experimental group the control group was taught by lecture-cum-demonstration method covering the same units of Biology as in the experimental group. The lesson plans for the control group focused on same instructional objectives. After the treatment of 45 instructional periods (2 months), same BAT was administered to the students in both groups

STATISTICAL ANALYSIS

Data were analysed using IBM SPSS Statistics -20 Software for the t-test followed by one-way analysis of covariance (ANCOVA). All values were expressed as mean (\pm SE). P-value < 0.05 was considered significant in the present study.

RESULTS

Independent sample t test for pre and post test of low achiever students

Pre test analysis of the low achiever student in both experimental and control group showed no significant differences in knowledge and applying levels while a significant difference were observed in understanding level and total achievement score. It indicates that the BAT score at pre level was not matched in both the group in terms of total score.

After the treatment with Informal CLS and traditional method in both the experimental and control group respectively, it has been observed that BAT score in both the group was increased but when compared with the control group the values were found to be significantly high in experimental group suggesting the positive effect of cooperative learning. The BAT score was significantly increased in knowledge level (31%, $p < 0.000$), understanding level (48.21%, $p < 0.000$), applying level (45.18%, $p < 0.000$) and total score (39.91%, $p < 0.000$) as compared to control group.

Table – 1. Independent sample t test for pre and post test of low achiever students

Tests	Variables	Group	N	Mean	Std. Deviation	Std. Error Mean	t	df	Sig. (2-tailed)
Pre test	Knowledge	Experimental	8	9.63	1.302	.460	2.002	15	.064
		Control	9	8.44	1.130	.377			
	Understanding	Experimental	8	6.63	1.061	.375	2.651	15	.018
		Control	9	5.00	1.414	.471			
	Applying	Experimental	8	3.38	.744	.263	1.490	15	.157
		Control	9	2.89	.601	.200			
	Total Score	Experimental	8	19.63	2.326	.822	2.900	15	.011
		Control	9	16.33	2.345	.782			
Post test	Knowledge	Experimental	8	24.75	2.252	.796	4.914	15	.000
		Control	9	18.89	2.619	.873			
	Understanding	Experimental	8	20.75	2.053	.726	6.363	15	.000
		Control	9	14.00	2.291	.764			
	Applying	Experimental	8	13.88	1.553	.549	4.816	15	.000
		Control	9	9.56	2.068	.689			
	Total score	Experimental	8	59.38	4.897	1.731	6.713	15	.000
		Control	9	42.44	5.434	1.811			

Table – 2. ANCOVA of BAT scores for low achiever students

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	1439.234 ^a	2	719.617	56.320	.000
Intercept	111.008	1	111.008	8.688	.011
Pre_Total	225.214	1	225.214	17.626	.001
Group	357.146	1	357.146	27.951	.000
Error	178.883	14	12.777		
Total	44821.000	17			
Corrected Total	1618.118	16			

a. R Squared = .889 (Adjusted R Squared = .874)

Table – 3. Estimated marginal means of low achiever students

Group	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
Experimental	56.485 ^a	1.439	53.398	59.571
Control	45.014 ^a	1.339	42.141	47.886

a. Covariates appearing in the model are evaluated at the following values: Pre Total Score Test = 17.88.

The ANCOVA analysis of lower achiever students indicated that F ratio at df 16 is $F_{(1,16)} = 29.951$ and $p=0.000$ is significant at .0001 level. It verify our previous findings that Informal CLS significantly enhances the achievement in low achiever students. Estimated marginal means of the experimental group (56.48) is higher than control group (45.04) as given in the table – 3.

Independent sample t test for pre and post test of average achiever students

Pre test analysis of the average achiever student in both experimental and control group showed no significant differences in any of the variable and also in total BAT score. It clearly shows that the BAT score at pre level was matched in both the group as the values were not significant.

After the treatment with Informal cooperative learning the BAT score was significantly increased in knowledge level (23.17%, $p<0.001$), understanding level (30.43%, $p<0.001$), applying level (29.51%, $p<0.001$) and total score (27.13%, $p<0.001$) as compared to control group which was taught by lecture-cum demonstration method.

Table – 4. Independent sample t test for pre and post test of average achiever students

Tests	Variables	Group	N	Mean	Std. Deviation	Std. Error Mean	t	df	Sig. (2-tailed)
Pre test	Knowledge	Experimental	14	10.36	1.692	.452	.638	27	.529
		Control	15	10.00	1.309	.338			
	Understanding	Experimental	14	7.50	1.225	.327	.053	27	.958
		Control	15	7.47	2.031	.524			
	Applying	Experimental	14	4.14	.949	.254	1.280	27	.211
		Control	15	3.67	1.047	.270			
	Total Score	Experimental	14	22.00	2.828	.756	.725	27	.475
		Control	15	21.13	3.543	.915			
Post test	Knowledge	Experimental	14	27.43	3.251	.869	4.819	27	.000
		Control	15	22.27	2.492	.643			
	Understanding	Experimental	14	23.57	2.563	.685	5.863	27	.000
		Control	15	18.07	2.492	.643			
	Applying	Experimental	14	15.71	1.773	.474	3.856	27	.001
		Control	15	12.13	3.021	.780			
	Total score	Experimental	14	66.71	5.497	1.469	6.783	27	.000
		Control	15	52.47	5.792	1.496			

Table – 5. ANCOVA of BAT scores for average achiever students

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	1938.594 ^a	2	969.297	63.971	.000
Intercept	591.177	1	591.177	39.016	.000
Pre_Total	468.633	1	468.633	30.928	.000
Group	1223.810	1	1223.810	80.768	.000
Error	393.957	26	15.152		
Total	104465.000	29			
Corrected Total	2332.552	28			

a. R Squared = .831 (Adjusted R Squared = .818)

Table – 6. Estimated marginal means of average achiever students

Group	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
Experimental	66.134 ^a	1.046	63.985	68.283
Control	53.008 ^a	1.010	50.933	55.084

a. Covariates appearing in the model are evaluated at the following values: Pre Total Score Test = 21.55.

Again the BAT scores of average achievers were analysed by ANCOVA as shown in above tables (5 and 6). The table 5 indicated that F ratio at df 28 is $F_{(1, 28)} = 80.768$ and $p=0.000$ is significant at 0.0001 level. It substantiated our previous results that informal CLS significantly enhances the achievement in average achiever students. Estimated marginal means of the experimental group (66.13) is higher than control group (53.00) as given in the table – 6.

Independent sample t test for pre and post test of high achiever students

Pre test analysis of the high achiever student in both experimental and control group showed no significant differences in any of the variable and also in total BAT score. It clearly shows that the BAT score at pre level was matched in both the group as the values were not significant.

The post test analysis of high achiever student showed a significant increased in knowledge level (8.8%, $p<0.05$), understanding level (29.44%, $p<0.001$), applying level (27.86%, $p<0.01$) and total score (20.12%, $p<0.01$) as compared to control group.

Table – 7. Independent sample t test for pre and post test of high achiever students

Tests	Variables	Group	N	Mean	Std. Deviation	Std. Error Mean	t	df	Sig. (2-tailed)
Pre test	Knowledge	Experimental	8	12.63	.744	.263	.505	14	.622
		Control	8	12.38	1.188	.420			
	Understanding	Experimental	8	9.50	1.512	.535	.000	14	1.000
		Control	8	9.50	2.070	.732			
	Applying	Experimental	8	5.75	.886	.313	1.426	14	.176
		Control	8	5.00	1.195	.423			
	Total Score	Experimental	8	27.88	2.475	.875	.678	14	.509
		Control	8	26.88	3.357	1.187			
Post test	Knowledge	Experimental	8	30.88	1.642	.581	2.224	14	.043
		Control	8	28.38	2.722	.962			
	Understanding	Experimental	8	28.00	2.268	.802	4.219	14	.001
		Control	8	21.63	3.623	1.281			
	Applying	Experimental	8	19.50	1.604	.567	3.157	14	.007
		Control	8	15.25	3.454	1.221			
	Total score	Experimental	8	78.38	4.470	1.580	3.730	14	.002
		Control	8	65.25	8.892	3.144			

Table – 8. ANCOVA of BAT scores for high achiever students

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	1152.846 ^a	2	576.423	32.638	.000
Intercept	54.354	1	54.354	3.078	.103
Pre_Total	463.783	1	463.783	26.260	.000
Group	483.482	1	483.482	27.376	.000
Error	229.592	13	17.661		
Total	83895.000	16			
Corrected Total	1382.438	15			

a. R Squared = .834 (Adjusted R Squared = .808)

Table – 9. Estimated marginal means of high achiever students

Group	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
Experimental	77.399 ^a	1.498	74.163	80.635
Control	66.226 ^a	1.498	62.990	69.462

a. Covariates appearing in the model are evaluated at the following values: Pre Total Score Test = 27.38.

The ANCOVA analysis of higher achiever students shows that F ratio at df 15 is $F_{(1, 17)} = 27.376$ and $p=0.000$ is significant at .0001 level. It validates our results of t- test analysis which also revealed that informal CLS significantly enhances the achievement in high achiever students. Estimated marginal means of the experimental group (77.39) is higher than control group (66.22) as given in the table – 9.

DISCUSSION

The traditional teaching methods used in most of the school promote competitive learning among students where, students always struggle hard for getting better position from others (Joshi, 2015). In competitive environment students always hangout in race with their classmates to achieve better grade and these competitive classrooms are dominated with anxiety and stress (Tanner et al., 2003). In this type of educational setup major job of the teachers is to transfer the bunches of knowledge from their head into the heads of students and prepare students to pass out the examination at any cost without realizing whether students understood the concept or just memorized the answers and they found very less opportunity to give individual attention. Consequently, the gap between poor performer and good performer deepens and subsequently poor students' (low achievers) losses the confidence and their self-esteem suffered a lot. They may undergo stress and depression in case of failure in examination or in some extreme situation commit suicide. It is the failure of school system which became failed to cater the individual need (Yaduvanshi, 2015). So, there is strong need to incorporate some alternative pedagogy which can prepare our students according to vision of NCF 2005 and equipped our teacher to design learning pathways for present century learner. Felder and Brent (2003) suggested that in contrast to traditional teaching approaches and competitive grading the cooperative learning promotes higher academic achievement, better high-level reasoning and critical thinking skills, deeper understanding of learned material, and less disruptive behaviour of students, lower levels of anxiety and stress, greater intrinsic motivation to learn and achieve, greater ability to view situations from others' perspectives, more positive and supportive relationships with peers, more positive attitudes toward subject areas, and higher self-esteem among the students. The present study revealed that informal CLS significantly improves the academic performance of diverse ability of learner including lower, average and higher achiever students at knowledge, understanding and applying level of cognitive domains. The responses of the students on opinionnaire revealed that they enjoyed their respective role and had lots of fun during group activities. After receiving the treatment of informal cooperative learning, about 75% students perceived that they enjoyed group activities, and group discussion seems helpful to solve tough questions. It had observed positive interaction developed among high and low achievers. More than 85% of the students opinionned that these activities were helpful to them in making new friends and studying Biology in the group was very much interesting. Results of the present study can be explained in light of the findings of Kibirige and Lehong (2016) they show that performance and motivation of learners improve when cooperative learning is used in science classroom. As the researches findings of Kenneth and Young (1999), Singhanayok and Hooper (1998), Khan (2012) and Majoka et al., (2007) showed that CLS has significantly improve the performance of lower achiever students. Felder and Brent (2003) observed that Low achievers students are likely to give up while working individually in traditional classroom set up, but when they working cooperatively, they are keep going. He further suggested that students of traditional classroom may tend to delay completing assignments or skip them altogether, but in cooperative classroom they know that others team member are counting their contribution, therefore they are motivated to do the work within scheduled timing. When the students are working under cooperative learning environment than, they are working together on group activity, promote each other learning thus, learning process become interesting and enjoyable (Panitz, 1999). So, lower achievers also take interest in academic task and actively participate in learning activities which contributes towards their success. Therefore lower ability students get benefited lots with the use of cooperative learning activities results in significantly high achievement in post test scores of BAT. Similar trends of enhancement in the performance of students achievement is also observed in average and higher ability students. The study shows the academic achievement of students of average ability is significantly increases at knowledge understanding as well as on application level. These results are in quite agreement with the findings of Numprasert (2006) and Buchs (2015) in which they found that structured CLS significantly increase the achievement of average achievers in comparison to traditionally taught groups. Since, cooperative learning creates excellent opportunities for students to engage in problem solving activities with the help of their group member (Effandi and Iksan 2007).

The cooperative learning classroom creates ample opportunities to the students to work interactively with their peer group and all types of students get benefitted from constant coaching, encouragement and constructive feedback from their team members. Ainley, Kos and Nicholas (2008) found in their study that 92% of learners agreed that discussing questions with others aided conceptual understanding, 82% agreed that listening explanations from others' facilitated their learning, and more than 90% reported that they felt most engaged and a active during class was when they were working with their peers in small groups. Therefore this strategy can enhance achievement of students at higher order of cognitive domain. This study further revealed that Informal CLS results in increase in achievement of higher achiever at all three levels of BAT i.e, knowledge, understanding and applying levels of cognitive domain which shows continue trends with the findings of earlier researchers Singhanayok and Hooper (1998), Armstrong (1999), Khan (2012), Numprasert (2006) and Gemechu and Abebe (2017) they all suggested that CLS improves the academic performance of higher achievers. Students

of higher academic ability found that their learning became stronger and concept became clearer during cooperative learning activities. When they explain and clarifying content to others often finds gaps in their own understanding, resolved their misconceptions and fill knowledge gaps side by side. But this results are contrast with the research findings of Kenneth and Young (1999), Majoka et al., (2007) and Buchs et al., (2015). A cooperative method of teaching engages learners twice effectively as compare to traditional method of teaching (Hake, 1998). This engagement may ultimately contribute towards high performance of students in cooperative classroom relatively to traditional classroom (MacManaway, 1970). Our findings suggest that informal CLS is one of important pedagogy in recent educational scenario which creates many of opportunities students centred learning in traditional classroom and ensure active involvement from all diverse ability of learner and hence, improve their achievement.

CONCLUSION

The implementation of informal CLS in Biology class has positive effect on diverse ability students of lower, higher and on average achievers. It significantly enhances the Biology achievement of all kinds of learner to that of their traditionally taught counterpart. Amalgamation of informal classroom with the traditional teaching learning processes creates many opportunities for active learning of the students. The classroom atmosphere is shifted from competitive to cooperative environment where, students of diverse ability help and motivate each other to learn. Thus, classroom is full of empathy, cooperation and harmony that reduce occurrence of unpleasant situation and maximizes the achievement of all diverse ability learners.

REFERENCES

- Abrami, P. C., Poulsen, C., & Chambers, B. (2004). Teacher motivation to implement an educational innovation: Factors differentiating users and non-users of cooperative learning. *Educational Psychology*, 24(2), 201-216.
- Achor, E.E., Wude, M.H. and Duguryil, Z.P. (2013). Do Cooperative Learning Strategies have the Potentials to Eliminate Gender Difference in Students' Achievement in Biology? The Effect of STAD and Jigsaw Cooperative Strategies. *Journal of Science, Technology, Mathematics and Education (JOSTMED)*, 10(1), 136-146.
- Ainley, J., Kos, J. & Nicholas, M. (2008). Participation in science, mathematics and technology in Australian education, ACER research monograph no.63, Australian Council for Educational Research, Melbourne.
- Al-Badawi GH. The Effect of Jigsaw versus Whole Class Instruction on EFL Students' Reading Motivation and Achievement. Department of Education of the Faculty of Arts and Sciences, American University of Beirut, 2005.
- Armstrong, M.N. (1999). Gifted students and cooperative learning: A study of grouping strategies. *Roe per Review*, 21(4): 315-316.
- Bowen, C.W. (2000). A quantitative literature review of cooperative learning effects on high school and college chemistry achievement. *Journal of Chemical Education*, 77, (1), 116-119.
- Buchs, C., Wiederkehr, V., Filippou, D., Sommet, N., Darnon, C. (2015). Structured Cooperative Learning as a Means for Improving Average Achievers' Mathematical Learning in Fractions, *Teaching Innovations*, 28, (3), 15-35.
- Effandi, Z. and Iksan, Z. (2007). Promoting Cooperative Learning in Science and Mathematics Education: A Malaysian Perspective. *Eurasia Journal of Mathematics, Science & Technology Education*, 3(1), 35-39.
- Felder, R. M., and Brent, R. (2003). Learning by doing. *Chemical Engineering Education*, 37(4), 282-283.
- Gemechu, D., Abebe, L. (2017). The Effect of Cooperative Learning on Academic Achievement of Grade Nine Students in Mathematics: The Case of Mettu Secondary and Preparatory School. *World Academy of Science, Engineering and Technology, International Journal of Educational and Pedagogical Sciences*, 11, (3), 720-726.
- Gubbad, A.A.M.A. (2010) The Effect of Cooperative Learning on the Academic Achievement and Retention of the Mathematics Concepts at the Primary School in Holy Makkah . *J. King Saud Univ., Vol. 22, Edu. Sci. & Islamic Studies* (2), 13-23.
- Hake, R. R. (1998). Interactive-engagement versus traditional methods: a six-thousand learner survey of mechanics test data for introductory physics courses. *American Journal of Physics*, 66(1):64-74.
- Iqbal, M. (2004). Effective of cooperative learning on academic achievement of secondary school students in Mathematics. (Doctoral dissertation) Retrieved from <http://eprints.hec.gov.pk/cgi/search/advanced>.
- Johnson, D. W., & Johnson, R. T. (2009). An educational psychology success story: Social interdependence theory and cooperative learning. *Educational Researcher*, 38(5), 365-379.
- Johnson, D. W., Johnson, R. T., Roseth, C., & Shin, T. S. (2014). The relationship between motivation and achievement in interdependent situations. *Journal of Applied Social Psychology*, 44(9), 622-633.
- Johnson, D.W., Johnson, R.T. (1999). Making cooperative learning work. *Theory into Practice*. 38(2):67-73. Retrieved from <http://www.jstor.org/stable/1477225>

- Johnson, D.W., Johnson, R.T., Smith, K.A. (1998). *Active Learning: Cooperation in the College Classroom*, (2nd ed.); Interaction Book: Edina, MN.
- Joshi SK, Bhatnagar S. (2015). Effect of cooperative learning oriented teaching on the academic achievement of secondary level students. *An International Peer reviewed and Refereed Scholarly Research Journal for Interdisciplinary Studies.*, III/XVII, 3015-3023.
- Kagan S. *Cooperative learning*. San Juan Capistrano: Kagan Cooperative Learning, 1994.
- Kenneth, D.J. and Young, A.M. (1999) Is cooperative learning effective for high achieving entrance students? Implications for policy and teaching Resources. *Journal of Research and Development in Education*, 33, 27-35.
- Khan. S.A (2012). The effect of cooperative learning on academic achievement of low achievers in English language in India. pp. 235-243
- Kibirige, I., and Lehong, M.J. (2016). The Effect of Cooperative Learning on Grade 12 Learners' Performance in Projectile Motions, South Africa. *Eurasia Journal of Mathematics, Science & Technology Education*, 12(9), 2543-2556
- Kosar, R. (2003). An experimental study on effects of cooperative learning on social studies achievement among 7th class students. Unpublished M.A dissertation. PAF College of Education for Women, Rawalpindi.
- Liao HC. Effect of Cooperative learning on Motivation, learning strategy utilization and Grammer Achievement of English language learner in Tiawan. Ph.D. Edu, University Of Orlean, 2005.
- MacManaway, L. A. (1970). Teaching methods in higher education—innovation and research. *Universities Quart.* 24(3):321-329.
- Majoka, M. I., Saeed., M., Mahmood., T. (2007). Effect of Cooperative Learning on Academic Achievement and Retention of Secondary Grader Mathematics Students, *Journal of Educational Research*, 10 (1) 44 - 56.
- Miller, R. H. (1992). A lesson in action research: Cooperative learning and achievement. *Schools in the Middle*, 2(1), 11-13.
- Muhammad, Z. (2010). Effects of cooperative learning intervention on mathematics achievement outcomes and attitudes of non-science college majors . Southern University and Agricultural and Mechanical College. Ph.D. Edu.
- Muraya DN, and Kimamo G. Effects of cooperative learning approach on Biology mean achievement scores of secondary school students' in Machakos District, Kenya. *Educational Research and Reviews*. 2011; 6(12), 726-745.
- National Curriculum Framework (NCF). (2005). Position Paper National Focus Group on Teaching of Science. National Council of Educational Research and Training (NCERT), New Delhi, India.
- Nayak, R. K. (2011). Effect of Cooperative learning strategy on students' achievement in mathematics at Elementry level. *Journal of Teacher Education & Research*. Vol.6, No.1
- Nnorom, N.R. (2015). Effect of Cooperative Learning Instructional Strategy on Senior Secondary School Students Achievement in Biology in Anambra State, Nigeria. *International Journal for Cross-Disciplinary Subjects in Education (IJCDSE)*, Special Issue 5 (1), 2424-2427.
- Numprasert., W. (2006). Cooperative Learning and the Achievement of Students in Science, Man, and His Environment, *AU J.T.* 9(3): 139-146.
- Pandey, N.N. and Kishore, K. (2003). Effect of Cooperative learning on Cognitive Achievement in science. *Journal of Science and Mathematics Education in S.E. Asia*, 26, (2), 53-60.
- Panitz, T. (1999), The Motivational Benefits of Cooperative Learning. *New Directions for Teaching and Learning*, 1999: 59–67. doi:10.1002/tl.7806
- Singhanayok, C., Hooper S., The effects of cooperative learning and learner control on students' achievement, option selections, and attitudes. *Educational Technology Research and Development*, 1998, 46, (2), 17–36.
- Siti Rahayah Ariffin. (1998). Pengajaran dan pembelajaran kooperatif sains: Satu pendekatan berkesan bagi Sekolah Bestari. *Prosiding Seminar Kebangsaan Isu-Isu Pendidikan Negara*, hlm 167-180.
- Slavin Robert E. (1991). Synthesis of Research on Cooperative Learning. *Educational Leadership*, 48: 71-82. EJ 421.
- Slavin, R. E. (2014). Cooperative learning and academic achievement: why does groupwork work? *Anales de Psicologia*, 30(3), 785-791.
- Sridevi, K. V. (2008). *Constructivism in Science Education*; Discovery Publishing House, Pvt. Ltd. New Delhi.
- Tanner, K., Chatman, L.S., and Allen, D. (2003). Approches to cell biology teaching: Cooperative learning in the science classroom-Beyond students working in groups. *A Journal of Life Science Education*, Spring 2, p.p. 1-15.
- Yaduvanshi, S. (2015). Cooperative learning strategy in Indian classroom: reason and Relevance. *Pillai Journal of Educational Research and Technology*, 4, (4). 11-16.

- Yaduvanshi, S., Singh, S. (2015). Cooperative Learning: An innovative pedagogy for achieving educational excellence. *International journal of Applied Research*. 1(11), 274-279.
- Yager, S. O. (1985). The effects of structure oral discussion during a set of cooperative learning lessons on student achievement and attitude. *Dissertation Abstracts International*, 46(6), 1588-A.