

EFFECT OF STUDENT'S TEAM ACHIEVEMENT DIVISION ON STUDENT'S ACADEMIC ACHIEVEMENT IN CHEMISTRY

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Abstract

Due to the increasing diverse nature of the world's education system, it is important that learning strategies are beneficial in educating a wide variety of students. For the retention and comprehension of the subject matter taught in the classrooms, teachers must engage students and provide them with the proper social skills needed to succeed beyond the classroom environment. The focus of the present study investigated the effect of a form of cooperative learning instruction that is students' team achievement division (STAD) with that of traditional lectures method. The population of the study was all the students studying chemistry at higher secondary level in Rivers state, Nigeria. 30 students of chemistry grade 12 in government higher secondary school Jamrud were selected as a convenient sample of the study. The students were divided into two groups one was called control group and the other was experimental group based on stratified random sampling techniques. The true experimental design of the posttest only control group design was applied in this study. The control group was taught with the traditional lecture method while the experimental group with the cooperative learning instruction STAD. Students academic achievements were find out by teacher made test composed of multiple choice questions, short questions and long questions. The credit of the test was of 50 marks, the posttest consist of multiple choice questions of 16 marks, short questions of 24 marks and one long question of two subsections having 10 marks. Student ttest of non-dependent sample was used to analyze the data. The result showed that the students' achievements of both the groups were not significant. The implications were discussed.

Keywords: STAD, students, chemistry, achievement

1. Introduction

Cooperative learning is a method used by educators can help students develop necessary social skills. Healthy interaction skills, success of the individual student and group members, and formation of personal and professional relationships are the results of cooperative learning (Johnson & Johnson, 1999a). Zakaria, chin & Daud (2010), concluded that, there are positive changes take place when a teacher changes his teaching method towards a more students-centered approach.

In cooperative learning, students work in pairs, to maximize their own and other learning. In addition, cooperative learning frequently new ideas and their solution i.e. process gain, develop high level of reasoning and transfer of information and knowledge from one situation to another situation i.e. group to individual transfer than any type of other learning, (Roger & Johnson, 1994) .

The end product of cooperative learning is higher achievements of individual as compared to competitive or individualistic efforts demonstrated by hundred of studies as revealed by Johnson, (2000).

The present study investigated the effect of a form of cooperative learning instruction that is students' team achievement division (STAD) with that of traditional lectures method in chemistry. Chemistry occupies the central position among the science subjects. It is a central subject in medicines, textiles, agriculture, chemical engineering; etc students ignore the subjects in spite of its scope in various fields of life. One of the greatest causes of students' anxiety towards chemistry is poor teaching methods, (Jegede, 2007).

STAD (Students team achievement division) according to Rai (2007) is one of the many strategies in cooperative learning, which helps promote collaboration and self-regulating learning skills. The reason for the selection of STAD is good interaction among students, improve positive attitude towards subject, better self-esteem, increased interpersonal skills. STAD also add an extra source of learning within the groups because some high achievers act as a role of tutor, which result in high achievements. Finally, it enables the students according to the requirements of the modern society by teaching them to work with their colleagues competently and successfully as explained by Balfakih (2003). The findings of Balfakih (2003) have indicated that in teaching 10th grade chemistry, students team achievements division (STAD) is a more effective teaching method than the traditional-teaching method.

Kinney (1989) conducted a similar study, by studying the effects of cooperative learning on the achievement of ninth-grade students in a diverse cultural general biology class. The experimental group having the combination of both black and white students had a significant increase on the academic achievement scores. Face to face, interaction in the classroom has an intense effect on the societal, cognitive, and scholarly development of students. According to Kagan, (1994) the learning process in which the interaction of students occur led to aquisition of skills development of language and social skills. As Iqbal (2010) mentioned that, the cooperative learning is more successful as a teaching learning practice as compared to customary teaching method. The structural approach to cooperative learning is based on the construction, investigation, and orderly use of structures, or content free ways of organizing social interaction in classroom as revealed by Kagan (1994)

Being the option for teachers in the teaching learning process cooperative learning as an instructional methodology is presently the least regularly used, (Johnson & Johnson 1991). Lecture method or competition contribute to more than 85% of the instruction in schools in which students are isolated from one another and forbidden to interact, (Johnson, Johnson, Holubec, & Roy, 1984). In addition, Goodlad, (1984) reported that teacher engaged most of the time in the classrooms, while only small fraction of time (about one percent) in the classroom is spared for students activities like reasoning and expressing their opinions.

In the light of the above discussions, the overall purpose of the proposed study was to investigate the effect of STAD on student's academic achievement. To achieve the objective of the study the following hypothesis were developed.

1: (H^o) = There is no difference between the achievement of control group and experimental group

2: (H_a) = There is discrepancy between the achievement of control group and experimental group

The level of significance is 0.05 and the degree of freedom is 23.

2. Methodology

The population of the study was all the students studying chemistry at higher secondary level in Khyber Pukhtunkhwa (Pakistan). 30 students of chemistry grade- 12 in government higher secondary school Jamrud were taken as a sample study. These students were divided into two groups one was called control group and the other was experimental group based on stratified random sampling techniques. The true experimental design of the posttest only control group design was applied in the study Gay (2000). The reason behind this experimental design was that, the duration of the study was limited only to two weeks. In this type of design, both the groups were randomly selected. The control group was taught with the conventional lecture method while the experimental group with the cooperative learning instruction STAD, developed by the Slavin (1996). The main reason of selecting students' team-achievement division (STAD) was to look into the overuse of lecture method and to develop innovation in teaching learning process.

The researcher himself taught both the groups for two-week duration due to time constraints. The contents of the two methods that is STAD and traditional method were the selected topics of inorganic chemistry grade 12 belong to unit 1, 2 & 3. After two weeks instruction, posttest was administered to both groups. The test composed of multiple choice questions, short questions and long questions. The credit of the test was of 50 marks, the posttest consist of multiple choice questions of 16 marks, short questions of 24 marks and one long question of two subsections having 10 marks. In the STAD method, new materials were presented to the students in the form of discussion or lecture method. Work sheet consists of problems or questions/answers were provided. After the process, students worked in pairs and thoroughly discussed the problems and quizzing each other. Sufficient time was given to the students.

Finally, individual quiz was administered, in which students were not allowed to cooperate with each other. Tests were marked immediately and formed individual scores into team scores by averaging all. The role of individual student was determined by how much each student's quiz score exceeded his past score average or

preset score based on students learning history. This way the entire group received a score based on each individual member's performance, (Borrich, 1996)

After the experimentation process, a teacher prepared posttest was then administered to both the groups. Two independent chemistry teachers, having equal experiences in the teaching of chemistry scored the test.

At the conclusion of the posttest, the score of the groups by examiner 1, examiner 2 and the difference between the mean test scores of the experimental group with the control group were subjected to a test of statistical significance, a student's t-test, (Gay, 2000).

3. Discussion

The correlation coefficient between the score of the two groups by the two examiners was very high that is 0.88. The mean of the two groups in the posttest for the two examiners indicated that the experimental groups taught with the STAD method performed better in the test than the control group taught with traditional lecture method. Since the calculated t-test, value that is 0.72904 is lower than the table value, which is 2.07 therefore the result showed that the difference in achievements between the two groups taught by traditional lecture method and cooperative learning method was not significant.

The findings of no significant difference in the posttest is consistent with Rosini B Abu, Jim Flowers & Fakultas Pengajian conducted research on home economics students, and Courtney, Courtney and Nicholson (1992), who investigated the graduate students in the subject of statistic found no significant difference in achievements between the two groups. As Slavin (1990), identified more than 70 high quality studies that compared cooperative learning with that of traditional methods in elementary and secondary schools. Out of 70 studies, 67 studies were about measuring effect on students achievements, with 41(61%) reporting higher achievements level in cooperative than in control classes. Twenty five (37%) found no difference and only one study the control group have higher level of achievements than cooperative learning

The no significant result of the two groups might be because the researcher was the instructor of the course. Specifically this threat that is termed as experimenter/research effect (Gay & Airasian, 2000), might have biased the findings of the study to some degree. However, keeping in mind that inter-rater reliability between the two examiner of the posttest was extremely high (i.e. 88%).

A threat to internal validity was of instrumentation. Due to open-ended nature, more than 60% of the posttest assessment of internal consistency was not difficult. Similarly, another threat to internal validity is that of experimental mortality. At the beginning of the study the total students in both the groups were 30, however it drops to 25 with 15 in the experimental group and 10 in the control group. Only pretest can control this threat. (Farooq, 2001). Due to lack of pre-test heterogeneous nature in both the groups were also not established which is core point of cooperative learning.

As Johnson (1992) explained that, there were marked difference between simply classifying students to learn and cooperative group processing among students. Although the cooperative learning group in this study were highly heterogeneous and structured in which the participants stayed together during the entire study duration, the findings suggest that even greater cooperative structured is needed in the course.

Similarly, the time and the location constraints, as mentioned by the Onwuegbuzie (2001) also affect the results of the two groups. Only fifteen minutes were available for the students STAD activities, which is too short for the mastery of the topic. Likewise, the location and space was not enough there not enough space for students to openly discussed their topic.

Many of the characteristics of STAD a form of cooperative learning as explained by Iqbal, (2010) are mutual interdependence of group members, individual accountability, and peer pressure due to common learning goals, continuous assessment and performance rewards. One of the reasons is the presence of continuous assessments in the non-experimental group due to which the result of the two groups are almost similar.

One of the prime important limitation of this study was that the result were obtained from relatively small, geographically limited sample of students, thus the extent to which the generalize ability of the findings of the present study to other students is a question requiring further research both qualitative and quantitative analysis techniques, (Onwuegbuzie, 2001).

4. Conclusion

The findings of the study revealed that the difference between the groups in term of their performance in the posttest was not significant. The non significant result might be due to lack of pretest which is the base for the random assignment of students to both experimental and control groups. Similarly in both the groups

heterogeneity in all respects were not maintained. Besides the mean of the score indicated that the experimental group outnumbered control group in their posttest. According to Borrich (1996), the outcomes of cooperative learning are, formation of attitude and values, provides model of pro-social behavior, presents alternative perspectives and viewpoints, build a coherent and integrated identity, and promotes critical thinking, reasoning, and problem-solving behavior. As a result, student team achievement division (STAD) a cooperative learning ought to be used as an instructional technique for teaching of chemistry to grade -12, regardless of the students' grades as envisaged by Rai, (2007).

References

- Abu, R.B., & Flowers, J. (1997). Effect of Cooperative learning Methods on Achievements, Retention and Attitude of Home Economics Students in North Carolina, *Journal of Vocational and Teacher Education*, 13(2). [Online] Available: <http://scholar.lib.vt.edu/ejournals/JVTE/v13n2/Abu.html>
- Balfakih, M.A. N. (2003). The effectiveness of students-team achievement division (STAD) for teaching high school chemistry in the United Arab Emirates. *International Journal of Science Education* 25(5), 605-624. <http://dx.doi.org/10.1080/09500690110078879>
- Borrich, G.D. (1996). *Effective teaching methods* (3rded.). Engle-wood cliffs, New Jersey: Columbus, Ohio.
- Courtney, D.P., Courtney, M., & Nicholson, C. (1992). The effect of cooperative Learning as an instructional practice at the college level. *College Students Journal*, 28(4), 471-477. [Online] Available: <http://psycnet.apa.org/psycinfo/1995-27045-001>
- Farooq, R.A. (2001). *Understanding Research in Education* (p-104). University Institute of Education and Research University of Arid Agriculture, Rawalpindi: (Pakistan).
- Gay, L.R., & Airasian, P.W. (2000). *Educational research: competencies for Analysis and application* (6th ed.) Englewood Cliffs, N.J, Printice Hall.
- Gay, L.R. (1996). *Educational research: competencies for analysis and Application* (5th ed.), p-37. National book foundation Islamabad Pakistan.
- Goodlad, J.I. (1984). *A place called school*. New York: McGraw Hill.
- Jegede, S.A. (2007). Student's anxiety towards the learning of Chemistry in some Nigerian secondary schools. *Educational Research and Review*, 2 (7), 193-197. [Online] Available: <http://www.academicjournals.org/ERR.2011.2.10>
- Johnson, D.W. (1992). Cooperative learning: increasing college faculty international Productivity. (ERIC Document Reproduction service NO ED 343465)
- Johnson, D.W., & Johnson, R.T. (1991). *Joining together: Group theory and Group Skills*. Boston: Allyn & Bacon.
- Johnson, D.W., Johnson, R.T., Holubec, R.J., & Roy, P. (1984). *Circles of learning: Cooperation in the classrooms*. Alexandria, VA: Association for supervision and Curriculum development.
- Johnson, D. W., & Johnson, R. T. (1999a). Making cooperative learning work. (Electronic version) *Theory in Practice*, 38 (2), 67-73. [Online] Available: <http://www.jstor.org/pss/1477225>
- Johnson, D. W. & Johnson, R. T & Stanne M.B. (2000). Cooperative learning Method: a Meta analysis exhibit -b.
- Kagan, S. (1994). *Cooperative learning*. San Juan Capistrano, CA: Kagan Cooperative Learning.
- Majuka, M.I., Dad, M. H., & Mehmood, T. (2010). Students Team Achievement Division (STAD) as an Active Learning Strategy: Empirical Evidence from Mathematics classroom. *Journal of Education and Sociology*, 16-20.
- Onwuegbuzie, A. J & DaRos-Voseles, D.A. (2001). The role of cooperative Learning in research methodology courses: A Mixed-Method Analysis. *Research in the Schools*, 8(1), 61-75.
- Onwuegbuzie A.J, Collins M T K, & Elbedour S. (2003). Aptitude by Treatment Interactions & Mathew Effect in Graduate-Level Cooperative learning groups. *The Journal of Educational Research*, 96(4). <http://dx.doi.org/10.1080/00220670309598811>
- Panitz, T. (1996). A Definition of Collaboration vs. Cooperative Learning. [Online] Available: <http://www.psy.gla.ac.uk/~steve/pr/ted.orig>

Rai, N., & Samsuddin, S. (2007). STAD Vs Traditional teaching, Redesigning Pedagogy –crpp conference 2007. [Online] Available: <http://conference.nie.edu.sg/2007/paper/papers/STU349.pdf>

Roger., & Johnson. (1994). *An overview of cooperative learning, creativity and Collaborative learning*. Brookes press Baltimore.

Slavin, R.E. (1996). Research for the Future: Research on cooperative Learning and achievements: what we know, what we need to know?, *Contemporary Educational Psychology*, 21, 43-69. <http://dx.doi.org/10.1006/ceps.1996.0004>

Slavin, R.E. (1990). *Cooperative learning: theory research and practice*. Englewood cliffs, NJ Prentice Hall.

Smialek. Boburka, T. Reiter .R. (2006). The effect of Cooperative learning exercises on The critical listening skills of college music-appreciation students, *Journal of Research in Music Education*, 54(1), 57-72. <http://dx.doi.org/10.1177/002242940605400105>

Zakaria, E., Chin, C.L., & Daud.Y. (2010). The Effect of Cooperative Learning on Students Mathematics Achievements and Attitude towards Mathematics. *Journal of Social Sciences*, 6(2): 272-275. <http://dx.doi.org/10.3844/jssp.2010.272.275>

The results of both the groups were the following:

Students' scores (mean)

Group detail	Number	Mean	Standard deviation	Students ttest
Experimental	15	20.1666	7.4322	0.72904
Control	10	18.5	9.559	

The students test value 0.72904 is greater than the table value 2.07, which shows that the difference between the two groups in achievement was not significant.

Students test score examiner-1

Group detail	Number	Mean	Standard deviation	Students ttest
Experimental	15	22.733	8.42	0.58336
Control	10	20.6	9.257	

The table reveals that the difference between the two groups was insignificant in achievement.

Students test score examiner 2

Group detail	Number	Mean	Standard deviation	ttest
Experimental	15	17.6	6.874	0.74904
Control	10	16.4	8.9839	

Again, the analysis of score obtained by the two different groups showed that the disparity between two groups in achievements was insignificant.

Since the student, ttest result for all the different variables exceeds 0.05 level of significance, therefore we agree to the null hypothesis that there is no difference in the achievements of the two groups in the posttest.