

## Effect of Peer Tutoring on Students' Academic Performance in Chemistry at Secondary Level

Dr. Muhammad Javed Aftab<sup>1</sup>, Muhammad Jawad Tehsain<sup>2</sup>, Dr. Munwar Bagum<sup>3</sup>

<sup>1</sup>Assistant Professor, Department of Special Education, Division of Education (DOE), University of Education, Township, Lahore, Pakistan

<sup>2</sup>Assistant Education Officer (AEO), School Education Department, Government of the Punjab, Multan, Pakistan, Email: [jawad.jawad786@gmail.com](mailto:jawad.jawad786@gmail.com)

<sup>3</sup>Assistant Professor, Department of Education, Institute of Southern Punjab, Lahore, Pakistan, Email: [munwarbagum@isp.edu.pk](mailto:munwarbagum@isp.edu.pk)

\*Corresponding author email address: [drmjavedaftab@gmail.com](mailto:drmjavedaftab@gmail.com)

### ABSTRACT

The prime objective of quasi experimental pre-test post-test design study was to analyze the effects of the peer tutoring on the academic performance of the students in subject of chemistry at secondary level. All 6998 male students enrolled in high and higher secondary schools of Tehsil Muzaffargarh were selected as population. But, two intact groups of grade 10th in Govt. High School Khan Pur Bagga Sher having ninety-five students were selected as sample of study. One section with 50 students (Experimental group) was taught using peer tutoring model and other section with 45 students (Control group) taught with conventional methods. The data was obtained on the basis of self-made pretest and posttest method based on BISE pattern. The data was analyzed by SPSS and descriptive analysis techniques of independent t-test and paired sampling test was used. It was concluded that significant differences occurred in experimental group students' academic performance level. The major findings of the study suggest that the use of peer tutoring has a positive effect on chemistry learner and enhancing the academic performance as well as closing the peer tutoring gap. Finally, this study provides the valuable implications for teachers, school administrators and policy makers to improve academic performance of chemistry learners.

### KEYWORDS

peer tutoring, academic performance, chemistry, secondary level

### JOURNAL INFO

HISTORY: Received: August 19, 2022

Accepted: September 25, 2022

Published: September 30, 2022

### INTRODUCTION

With the up gradation and gradual movement towards the research in science sector like scientific discipline and educational areas, pupils are the major subject matter of the discussion of the educators. The educational sector has developed a noteworthy progress in growth about the character of human learning and therefore the circumstances have enhanced the assorted areas of the educational development (Grubs, 2009; Johns & Kolka, 2005; MacDonald, 2000; Sandford, 2015; Smith, & Nicolai, 2013). Aguayo et al. (2017) ascertained a rise in linguistics process by the effect of the peer tutoring and learning wherever mutual understanding and cooperation increased to promote the teaching, learning and peer tutoring process at primary, elementary and secondary level.

Moreover, it's additionally expressed that motivation is associate degree factor that's place into concentrate of the mutual cooperation and understanding to one another (Hartman, 2010; Landrum & Chastain, 1998; lee & Bush, 2003; Santee & Garavalia, 2006; Topping, 1996). Human beings learn more if they repeat same behavior many times, and therefore the theory behind this kind of learning in most western faculties is viewed through the viewpoint's creative person (Gan, 2008; Madrid et al., 2000; Marshall et al., 2019; Pearson, & Johnson, 1978). Peer tutoring programs are getting a lot of widespread among the high and better education establishments. Topping (1996) outlined that mutual learning of the students or peer because the "achieving of data and ability of working through positive serving to students and coordinating among standing equal or compared with peers". The peer tutoring concentrates on individuals from similar and in grouping during the classroom work (Mitchem et al., 2001; Mehra, & Mondal, 2005; Russ, 2015).

Saunders (2002) and Shabani et al. (2013) have themed that the peer teaching as cooperative learning methodology supported by the thought of peer students. World Health Organization (2020) shares a typical goal and 'asymmetrical' relationship. Peer tutoring is associate degree filmable, peer-intervened technique that features understudies filling in as scholastic coaches and tutees. Here reasoned that the next playacting understudy is combined with a lower playacting understudy to audit basic pedantic or conduct concepts. However, the term peer tutoring is employed to incorporate each variety. It's additionally seen that some studies have reported that there's more issue as a natural peer tutoring occurs (Mastropierri et al., 2003; Mcpherson, & Nunes, 2013; Outhred & Chester, 2010).

Damon and Phelps (1993) described the peer learning or teaching is usually referred to as "cross-age" tutoring, as a result of the tutor are sometimes 2 or a lot of old years among the tutee. In going to deep sense of thought, the "peer tutoring" is an object of associate degree. The tutor may well be elder than the learner in cross age tutoring that generally this is often



accustomed embrace each variety. The proper definition of peer tutoring was given by the Damon and Phelps (1989), they stated that it is associated with the degree in which one kid having a linked with other kid in material on which the first is a professional and the second is an inexperienced student (Miller, 2003).

Oviawe (2008) and Comfort (2011) explained that it could be a group of the activities, disciplines, coaching and enlightenment within which experienced students facilitate and get knowledge by guiding one another. Colvin (2007) also described that its associate degree tutorial system within which students teaches alternative students. Bombardelli (2016) expressed that it happens once tutor and learner are at a similar age. However, several definitions of peer tutoring are present, and that all don't seem to be consistent. For example, all groups of peer tutoring are not expert. They are generally assigned tasks to teach or help their class fellows of same age or different or cross age groups in their studies (Greenwood et al., 1989; Palincsar & Brown, 1986) or equal level of class grade means same class (Comfort & McMahon, 2014).

Saito (2008) opined that for the achievement of the good and healthy peer tutoring process, acquisition to gain of information is not depending on the definition of the terms, disciplines, processes, memories and knowledge but it is consisted on the active interrelation of the students in peer tutoring procedure (Mumford, 1997). The term "peer tutoring" is usually overlapping with each different age and equal age tutoring. Saito (2008) also states that the peer tutoring happens once tutor and tutee having the same or equal age and if the tutor having large age than the learners called as cross-age tutoring. However, the pairing in the different age groups of students is not confusing, it is only on the academic performance of students in class room or in groups form. Similarly, the pairing of same groups of students can be taken for study purpose (same-age group) in peer tutoring technique of teaching learning process (Dishion, 1999; Vasay, 2010).

Finally, it has been seen that in mutual instruction method as in peer tutoring method different conceptual terms are used like peer tutoring in same groups or in different age groups that are commonly used in tutoring process and verbal conversation or communication constantly (Buzbee, 2005). On the premise of various definitions of the peer tutoring, there are five major styles of the peer tutoring.

Firstly, category wide peer tutoring within which each student within the category is linked with each other's in classroom, teachers gave a lesson as to the tutor students and tutor students gave the same lesson to their other students like tutee. Secondly, cross-aged tutoring is that within which students in higher grade levels. World Health Organization works with younger students. Thirdly, one to one tutoring suggests that one tutor, one student – it's as straightforward as that. A matched tutor solely works with one student at a time, between half-hour and one or two hours with a toddler. Fourth, small group instruction sometimes follows whole group instruction to bolster or re teach specific skills and ideas and provides a reduced student-teacher magnitude relation. Fifth one is home-based tutoring within which the learner is treated reception level by adult learners or oldsters (Topping, 1996). Moreover, many benefits have been evaluated from the peer tutoring, the inspiration to study, advancement in average grades; in accumulation to the others values like socialization skills as enlightening academic performance (Duran, 2004).

Academic benefits of the peer tutoring are healthy participation of students, their problem-solving method, facilitation of others pupils and giving feedback to others students in their work to minimize the anxiety among the students (Topping, 1996). Tong (2004) also explained that achievement in performance can be increased by this method of teaching, and the overall assessment can be taken out easily. They also concluded that tutors are likely to experienced one and they are helpful to take the assessment process during peer tutoring. The tutors go to explain the ideas, concepts and other content knowledge in detail or deep sense to the tutee during learning time in classroom.

Topping (1996) suggests that peer tutoring merely prepared and enhanced the mental attention, cognition and motivational skills of tutors during the work. It is also viewed that Peer tutoring is also used to increase the other skills of the tutee or learners. Schleyer et al. (2005) examined that the results of peer tutoring generate the ability of problem solving, managing of tasks and minimizing the staff deficiencies among tutors. Additionally, Saenz et al. (2005) examined the influence of Peer-Assisted Learning Strategies (PALS) study which was taken on the Spanish students in reading abilities having learning disabilities (L.D) also.

According to the Rizve (2012), children are performing better in their zone of proximal development by peer tutoring method from the students who are still treated in traditional methods of studies like lecture method etc. Like, Moreneo and Duran (2002) viewed that it is a cooperative learning among the students which polishes their mind and generates new concepts of thinking because we believed that the tutor and tutee don't equal academic ability but they share a typical information, goals and tasks to one another. Yusuf (2004) pointed out that this goal must be achieved through a relationship framework organized by the teacher to advance the child cognitive development. Peer tutoring is considered as a powerful source of change of behavior of learners.

Fuchs et al. (2002) argued that peer tutoring participates in the character improvement, upgrading and enhancement of schoolchildren during their socialization, learning class room condition, and interaction. Peer tutoring was discovered to be useful in interaction and association experience because the degree of cooperation among students both inside and outside the study room improved fundamentally. Considering the above-mentioned background, there's sufficient proof in literature about

the usefulness of peer tutoring at secondary level especially in teaching the various subjects in enhancing the students' performance or learning outcomes in any respect educational level.

It can, thus, be concluded that together with other school facilities, promoting the culture of peer tutoring is additionally essential for enhancement of students' learning outcome. As mentioned earlier, the past several years have witnessed an ascent of technology and its use in education. A touch effort has been made to extend the standard of education. Similarly, usefulness of peer tutoring has not much been studied from the angle of students' performance at secondary level (Vygotsky, 1987).

Nicholas (2021) also reported that children having high literacy rate have a great influence on the achievement of others students in the class room environment. It's believed that through impersonation, ones conduct and cognizance are impacted. Some problems facing by teachers moreover as educational department may also be overcome by this strategy also like restriction of teachers and infrequent financial assets will be overcome by peer tutoring, i.e., appointment and engagement of volunteers and deep-rooted experienced students. Furthermore, due to its participatory tactic, peer tutoring may additionally help in controlling and regulating the drop-out of the low achiever students to a greater extent (Topping, 1996). Like so on, Peer tutoring has been shown to end in improved transferable skills and better degree assessment outcome (Topping et al., 1997).

## RESEARCH HYPOTHESES

Following three hypotheses were formulated to test the main objectives of the study.

1. There is no significant difference between the overall mean score of experimental and control group with respect to pretest.
2. There is no significant difference between the mean scores of overall experimental and control groups with respect to posttest.
3. There is no significant difference between the overall mean score of experimental groups with respect to pretest and posttest.

## METHOD AND PROCEDURE

### STUDY DESIGN, POPULATION AND SAMPLE

The study employed the Quasi Experimental pre-test post-test design. Cresswell (2012) explained that this study established cause and relationship between independent and dependent variable. In this design, two intact / pretesting groups were taken based on non-random criteria. This was because the experimenter could not artificially create groups for the experiment and another reason was that educators often used intact groups (schools, colleges, or school districts) in experiments, quasi-experimental designs were frequently used. All the High schools having secondary classes were the population of the study and study was conducted at the Govt. High School Khan Pur Bagga Sher Tehsil Muzaffargarh only. There were 119 students enrolled in class 9<sup>th</sup> and 95 students were enrolled in class 10<sup>th</sup>. The overall population of the secondary portion of the school was 214.

Researcher selected the class 10<sup>th</sup> students as a sample of study and there were 50 students in section "A" and treated as experimental group. The enrollment of section "B" was 45 and treated as control group for study. The school selected in experimental group had two intact / pretesting sections labeled as section A and section B. Students of Section "A" was selected as experimental group and the students of section "B" was selected as control group. The experimental group was taught through peer tutoring model, while the control group received instruction through conventional method.

### TOOL DEVELOPMENT AND VALIDATION

The data collection tool used in this study was 10<sup>th</sup> grade chemistry test. Researcher personally prepared pre-test and post-test in line with the prerequisites of 10<sup>th</sup> grade already taught syllabus to measure the students' chemistry achievement. The pre-test was developed consistent with prescribed and standard pattern of Board of intermediate and secondary education Dera Ghazi Khan. The test containing 60 marks was divided into three parts i.e., 12 marks for objective, 30 marks of short questions and 18 marks of long answered questions.

The pretest was developed consisted of first four chapters of chemistry as well as from the exercise of these chapters which had already taught to students by school's teachers. The pretest was prepared having sixty marks containing the MCQs, Short answers questions and Open-ended long questions. The distribution of marks was allocated according to the scheme of Board of Intermediate and Secondary Education and twelve multiple choice questions (MCQs) were selected from these four chapters and exercise, each having the one marks and over all twelve marks were given to the MCQs. The next section of the test was subjective type test consisted on the four questions; from question number two to four were short questions having 10 marks of each section, overall, 30 marks were given to this section.

Moreover, from question number five to seven were long questions, pertaining to eighteen marks with the choice of one question. Here, the students have a choice to attempt any two questions. The sample of test was prepared from first four

chapter of tenth class in chemistry subject for experiment on the basis of recommended board pattern of Board of Intermediate of Secondary Education Dera Ghazi Khan.

The content of chapters and exercise of these chapters were used according to the level of the students to develop the research tool. The content selection was used in pretest was meaningful, easy to understand able and stem of questions were justifying and simple. Researcher used the same test for pre-test and post-test to make sure the reliability with regards to content, format as well as its cognitive level. An initial draft of test was prepared after the opinion of three experts. A pilot testing was conduct at nearby school Govt. High School Muradabad. The participants of the pilot testing are requested to give feedback about the relevance and format of test items, test reliability, time required for test completion and other concerns regarding the test. More ever, a test was finalizes in line with changes suggested by the panel of experts and participants of pilot-testing. The validity of test was checked by expert who took deep analysis of items of questions, their statements and language used in test tool.

Reliability was detected or perceived as the degree to which a test was free from estimation for mistakes, since the more estimation blunders happen the less tried and true the test would be (Fraenkel & Wallen, 2003; Schumacher & Mcmillan, 2006; Moss, 1994). Reliability of the calculating of results and their consistency could be checked out by IBM, SPSS statistics software and the appropriate alpha value was decided to increase the reliability and the value of Cronbach Alpha was found 0.8.

### **TOOL ADMINISTRATION AND DATA COLLECTION**

This Quasi Experimental pre-test post-test design of study was completed in two students' sections of grade 10<sup>th</sup> of Govt. High School Khan Pur Bagga Sher, Muzaffargarh after completing the requisite permission process from school administration. Prior to begin the experiment, a pre-test was taken with sample students of both sections (A & B) and obtained scores were interpreted. Pre-test was conducted to check the academic level of students in already taught syllabus of chemistry. After scoring the tests, it was examined that mean scores of the both groups before the experiment found almost the same.

The experimental group was taught by peer tutoring model by the researcher and control group with conventional method by the already allotted schools' teachers. A lesson plan was developed for each session of peer tutoring model. Furthermore, all the lesson plans were approved by the expert and administration of the school. Finally, post-test was taken from the both groups to measure the effectiveness of peer tutoring model after eight weeks.

The two equivalent groups were made to analyze the effect of peer tutoring on the academic performance of students at secondary level at Govt. High School khan Pur Bagga Sher Tehsil and District Muzaffargarh. The experimental group belonged to section "A" and control group belonged section "B". The experiment group was taught by peer tutoring strategy. The control group of study was taught by school teacher, who used the old traditional method for teaching. There was no treatment like peer tutoring was given to the control group i.e., section "B".

The experimental group was divided into two sub groups like tutor and tutee. The proper division of teaching sessions was scheduled to teach them by peer tutoring technique. The study period for experiment was eight weeks. The proper lesson planning for each week was made and every week consisted of the selection of topics from the text book of subject chemistry for class 10<sup>th</sup>. The course contents were divided according to time allotted for study and duration of lesson. The main students learning outcomes were made according to text book criteria and scheme of study provided by the board based on the standard pattern.

During the experiment, the tutors are advised to teach, help and assist their other group's members so that learning as well as teaching was made in friendly and peace full environment. During the session, the overall academic activities were examined like their group discussions, their activities, their participations and completion time of any assigned task during the peer tutoring process. If any group was facing any problem or difficulty in their studies, then their problems were solved and appreciated them in their achievement. All groups belonging to the experiment were examined carefully and monitored properly. A proper time was given to them for group discussion and questions answer session.

At the end of every week, a discussion session was also conducted to review the summary or achievements about the lesson. So on, eight weeks scheduled were conducted properly and contents of subject as well as exercise of the chapters were taught by peer tutoring method and in the last week a revision was made for the preparation of posttest. Now, it was observed that not only tutors but tutees have a capacity to get through the posttest or perform better because they got maximum knowledge by their group members as well tutors through peer tutoring.

The control group was taught by already allotted school teachers and they delivered their contents by traditional and lecture method as well. There was no any grouping of students like tutors and tutees for learning process. No problem-solving technique was used; this group was only limited to the old or traditional method of study. Here, it was also observed that students were facing problems in their concept clarity as well as content knowledge.

After completing the eight-week duration of study, a posttest was conducted. The experimental and control groups were taken a participant. Their posttest feedback was collected by marking their paper as per rubrics. The obtained scores were arranged according to the students and the overall testing of hypotheses were made by analysis of data through special software program like SPSS 26.

## DATA ANALYSIS AND RESULTS

The study was conducted at Govt. High School Khan Pur Bagga Sher Tehsil and District Muzaffargarh to find out the effect of the peer tutoring on the academic achievement of students in Chemistry at secondary level. The demographic information of the participants is given in the Table 1.

Table.1. Demographic Information of Sample Students

Grade	Subject	Gender	Age	Group	N	% Age
10 <sup>th</sup>	Chemistry	Male	14-17 Year	Experimental	50	52.6 %
				Control	45	47.4 %
				Total	95	100 %

Table 1 shows that the study was conducted at grade tenth students who were studying the subject chemistry. The age range of the students was 14-17 years; there were 50 students in section "A" who were labeled as experimental group and 45 students were enrolled in section "B" was taken as control group. The experiment group was 52.6% and control group was 47.4 % of the sample of study. 95 students were taken for the sample of study. From Table 1, it was concluded that percentage (52.6%) of the experimental group was larger than the control group and also depicted in Figure 1.

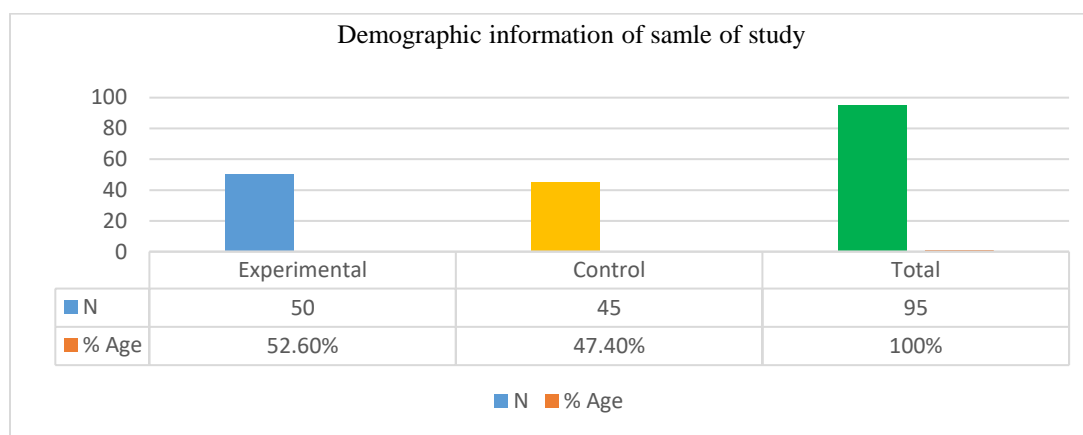


Figure.1. Demographic information of sample students

H<sub>0</sub>1: There is no significant difference between the overall mean score of experimental and control group with respect to pretest.

Table.2. Independent sample t-test for experimental and control group pretest

Group	N	Mean	Std. Deviation	t	df	Sig
Experiment	50	43.9	7.08	1.85	93	0.98
Control	45	41.2	7.18	1.85	91.6	

Table 2 demonstrates the results of an independent-samples t-test that was applied to match the overall mean score of experimental and control group with respect to pretest. Table 2 also reveals that the p values for overall mean score of experimental and control group with respect to pretest was found .98. It describes that the mean of the Experimental group is 43.9 and the Control group is 41.2. More ever, the mean values indicated that both the groups are normally distributed and seemed almost equal. The values of df (Degree of freedom) indicates that there is difference of 1.4. More ever, it is concluded from Table 2 that both groups are near to equal in academic performance in Chemistry in pre-test. It was concluded from Table 1 that the value of Sig. was greater i.e., 0.98 than the assigned value 0.05 so the null hypotheses was accepted and same data is reflected in Figure 2.

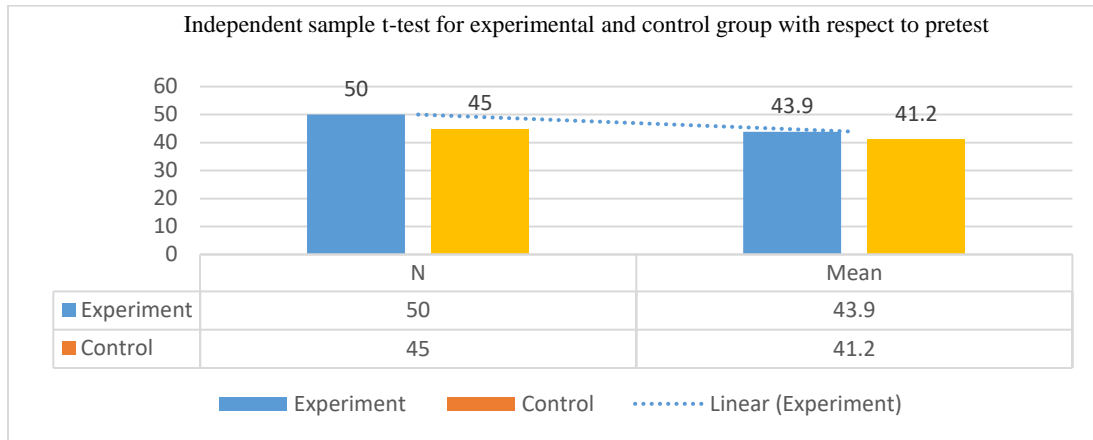


Figure .2.Independent sample t-test for experimental and control group pretest

H<sub>0</sub>2: There is no significant difference between the mean scores of overall experimental and control groups with respect to posttest.

Table.3.Independent sample t-test for experimental and control group posttest

Group	N	Mean	Std. Deviation	t	df	Sig
Experiment	50	50.82	3.96	3.82	93	0.00
Control	45	45.91	8.05	3.70	62.62	

Table 3 displays results of an independent-samples t-test that was applied to compare the overall mean score of experimental and control group with respect to posttest. Table 3 also reveals that the p values for overall mean score of experimental and control group with respect to pretest were greater than .005 i.e., .00. It indicates that the mean of the Experimental group is 50.82 and the Control group is 45.91 having the difference 4.91. The values of df (Degree of freedom) indicates that there is difference of 30.38. Table 3 interpreted that the both groups are not equal in academic performance in Chemistry at the end of experiment or after the treatment through peer tutoring method and there is a significance difference in academic achievement at that time. Table 3 has a conclusion that the value of significance level is less than 0.05. From Table 3, it can, thus, be inferred that there is a rejection of null hypothesis and a significance difference is seen in overall performance of experimental and control groups in posttest achievement and also described in Figure 3.

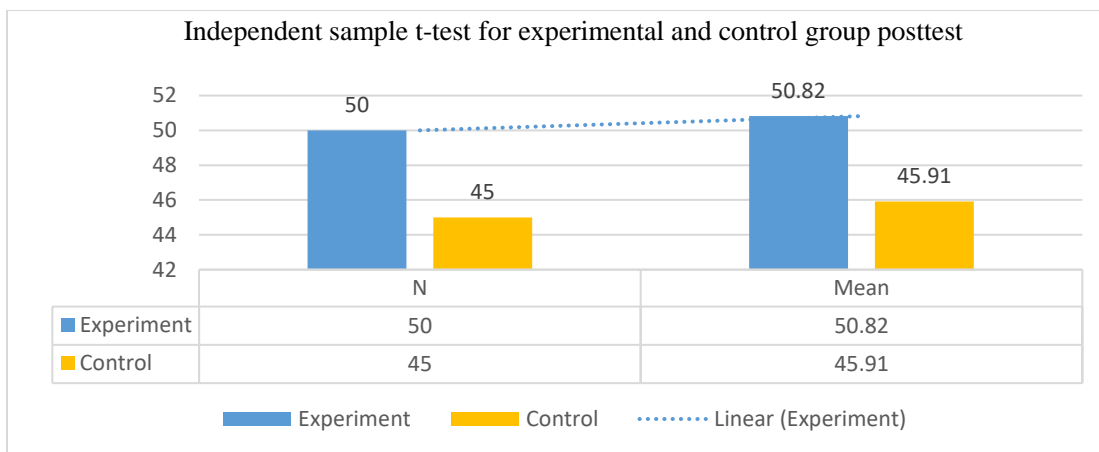


Figure.3.Independent sample t-test for experimental and control group posttest

H<sub>0</sub>3: There is no significant difference between the overall mean score of experimental groups with respect to pretest and posttest.

Table 4. Paired sample t-test for experimental group with respect to pretest and posttest

Group	N	Mean	Std. Deviation	t	df	Sig
Pretest	50	43.92	7.08	6.3	49	0.00
Posttest	50	50.82	3.96			

Table 4 indicates that a paired-samples t-test was conducted to compare the significant difference between the overall mean score of experimental group with respect to pretest and posttest. There was a significant difference in the scores for pretest experiment group (M=43.92, SD=7.08) and post experiment group (M=50.82, SD=3.96) and the standardized value of p is 0.005 (P=0.005). These results recommend that there is an increase in the academic performance of students in Chemistry. Specifically, our results advocate that when treatment like peer tutoring is given to the experimental group, there is utmost increase in their performance. More over, from Table 4, can also conclude that the value of p is 0.00 which is less than the assigned value i.e., 0.005, so the hypothesis is rejected because the value of p (0.00) illustrates that there is a significance difference in these two groups with respect to their academic achievement as shown in Figure 4.

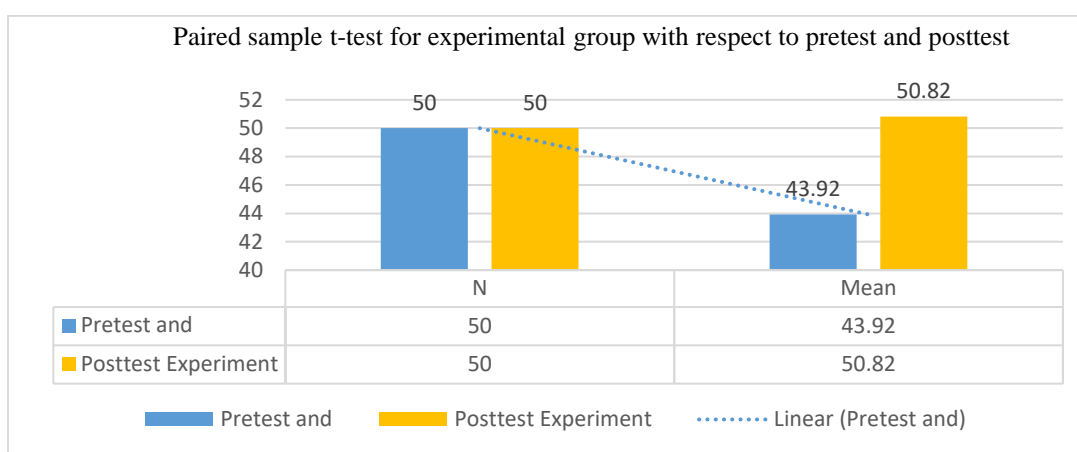


Figure 4. Paired sample t-test for experimental group with respect to pretest and posttest

## DISCUSSION

The main objective of quasi experimental pre-test post-test design study, therefore, was to analyze the effect of peer tutoring on students' academic performance in chemistry at secondary level. Furthermore, the objectives of the study were to find out the effect of peer tutoring on the academic achievement of students in the subject of chemistry and to analyze the difference in the performance of students taught using peer tutoring and conventional instructional strategies in chemistry.

All 6998 male students enrolled in high and higher secondary schools of Tehsil Muzaffargarh were selected or taken as population. But, two intact / preexisting sections of grade 10<sup>th</sup> into Govt. High School Khan Pur Bagga Sher having ninety-five (95) students were selected as sample of study. One section with 50 students (Experimental group) was taught using peer tutoring model. While the other section with 45 students (Control group) received instructions with conventional methods. The data was obtained on the basis of pretest and posttest method. The data was analyzed by SPSS version 28.0 and by applying descriptive analysis techniques of independent t-test and paired sampling test.

The mean scores of the both groups with respect to pre-test was found near to same before the treatment like peer tutoring model. More over, the results of inferential statistics revealed that academic level of students in both groups was comparable before the treatment (Cresswell, 2012). While, from the inferential statistical results of post-test data, it was found that there was a significant difference in experimental group students' academic achievement level who received instructions with peer tutoring method (Egger, 1995; Sadovi, 2008; Philip & Council, 2010; Pugatch & Wilson, 2018; Shabani, 2002; Stigmar, 2016; Vigotsky, 1989; Web et al., 2006). More over, Hypotheses like "There is no significant difference between the mean scores of overall experimental and control groups with respect to posttest" was rejected. Because, p value is less than the table value. Results portrayed a positive effect of peer tutoring on the academic performance of students in chemistry at secondary level.

More over, similar results also found by the study conduct by others' researchers (Ali et al., 2015). Ali et al. (2015) resulted that peer tutoring has a positive effect on the learning of students. Similarly, Kaleem et al. (2018) reported that peer tutoring has a significance effect on the students' academic performance and effect of tutors and tutee was also examined to

check out the reading influence. The reading fluency can be increased by peer tutors and tutees relationship at secondary level (Hagen & Hennemann, 2019; Santee, & Gravalia, 2006).

Finally, it was found that the students' performed better in chemistry after treatment like peer tutoring model. The study gave importance on the use of peer tutoring because it has a positive effect on chemistry learner, their academic achievements' as well as closing the peer tutoring gap (Maheady et al., 2001) Similarly, this study provides the valuable implications for teachers, school administrators and policy makers to improve academic performance of chemistry learners.

## CONCLUSIONS AND RECOMMENDATIONS

Statistical data analysis of findings concluded as the performance rate of both control and experiment groups were not equivalent so there was significance different in their performance. The pretest scores of experiment and control groups showed that there is a no much significance difference in the academic performance of students in chemistry. The posttest scores of the experiment groups provided the evidence that the academic performance of the students in chemistry subject increased positively. Learning through peer tutoring showed the better results in final posttest than the traditional method used to control group of study. Here, it is also seen that the peer tutoring is a good way of teaching in which any activity should be given to the students and monitor directly and easily by the teachers. It should be taken in implementation at public, private and any other educational institutions to get the more favorable results at secondary level. The study highly recommends that peer tutoring strategy should be used during the academic activities of high schools especially in the teaching of science subjects like chemistry. Similarly, the higher authorities and educational administrators should pay a special attention on the peer tutoring during the preparation of lesson planning.

## CREDIT AUTHOR STATEMENT

**Dr. Muhammad Javed Aftab:** Conceptualization, Methodology, Data collection, Data analysis, Writing- Original draft preparation. **Muhammad Jawad Tehsain:** Introduction; Methodology, Data analysis, Data interpretation, Results, Writing- Reviewing and Editing, **Dr. Munwar Bagum :** Literature Review, Methodology, Data Collection, Editing, Proofreading.

## COMPLIANCE WITH ETHICAL STANDARDS

It is declared that all authors don't have any conflict of interest. It is further declared that although data were collected from students of secondary schools, but informed consent was obtained from all individual participants (and their parents) included in the study.

## REFERENCES

- Ali, N., Anwar, M., & Abbas, J. (2015). Journal for Studies in Management and Planning. *Impact of Peer Tutoring on Learning of Students*, 1(2), 61-65.
- Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory*. Englewood Cliffs, NJ: Prentice Hall. U.K. 112-115.
- Bandura, A. (1997). *Self-Efficacy: The exercise of control*. Freeman.
- Bandura, A., & Schunk, D.H. (1981). *Cultivating competence self-efficacy, and Social Psychology*, U.K. 48,251.
- Buzbee-Little, P.F. (2005), "Peer coaching as a support to collaborative teaching", *Mentoring and Tutoring: Partnership in Learning*, 13 (1), 83-94.
- Chastain, G. (1998). Demonstrating tutoring effectiveness within a one-semester course. *Journal of College Student Development*, 39(5), 502-508.
- Colvin, J. N. (2007). Peer tutoring and social dynamics in higher education. *Mentoring and Tutoring*, 15(2), 165-181.
- Comfort, P. (2011), "The effect of peer tutoring on academic achievement during practical assessment in applied sports science students", *Innovations in Educational and Teaching International*, 48 (2), 207-211.
- Comfort, P., & McMahon, J.J. (2014). The effect of peer tutoring on academic achievement. *J. Appl. Res. High. Educ.* 6, 168-175.
- Damon, W., & Phelps, E. (1989). Critical distinctions among three approaches to peer education. *International journal of educational research*, 13(1), 9-19.
- Duran, D. & Vidal, V. (2004). Peer tutoring: from theory to practice. *A cooperative learning method for diversity in secondary school*. Barcelona
- Fuchs, L. S., Fuchs, D., Hamlett, C. L., Phillips, N. B., Karns, K., & Dutka, S. (1997). Enhancing students' helping behavior during peer tutoring with conceptual mathematical explanations. *Elementary School Journal*, 97(3), 223-250.
- Fuchs, D., Fuchs, L.S., Mathes, P.G., & Simmons, D.C. (1997). Peer-assisted learning strategies: *Making classrooms more responsive to diversity*. U.S.A. 295,301,313.

- Fuchs, D., Fuchs L. S., Mathes, P. G., & Martinez, E. A. (2002). Preliminary evidence on the social standing of students with learning disabilities in PALS and no-PALS classrooms. *Learning Disabilities Research & Practice, 17*(4), 205–215. <https://doi.org/10.1111/1540-5826.00046>
- Fantuzzo, J. W., Polite, K., & Grayson, N. (1990). An evaluation of reciprocal peer tutoring across elementary school settings. *Journal of School Psychology, 28*(4), 309-323. Retrieved from [http://dx.doi.org/10.1016/0022-4405\(90\)90021-X](http://dx.doi.org/10.1016/0022-4405(90)90021-X)
- Greenwood, C.R., Carta, J.J., & Hall, V. (1988). The use of peer tutoring strategies in classroom management and educational instruction. *School Psychology Review, 17*(2), 258-275.
- Grubs, N. (2009). The Effects of the Peer Tutoring Program: An Action Research Study of the Effectiveness of the Peer Tutoring Program at One Suburban Middle School. *Ga. Sch. Couns. Assoc. 16*, 21–31.
- Hagen, T., & Hennemann, T. (2019). Playing the Good behavior Game Suring a Peer Tutroing Intervention: *Effects on Behavior and Reading Fluency of Tutors with Behavioral Program. 16*(1), 59-77.
- Harper, G. F., & Maheady, L. (2007). Peer-mediated teaching and students with learning disabilities. *Intervention in School and Clinic, 43*, 101-107
- Hartman, G. (2010). Peer learning and support in audio-teleconference in continuing education for nurses. *Distance Education, 11*(2), 308-319.[https:// doi: 10.1080/0158791900110209](https://doi.org/10.1080/0158791900110209)
- Johns, M., & Kolka, V. (2005). The psychological growth of peer mentors in a college program for students on academic probation. *Psychological Growth of Peer Mentors in College.*
- Johson, D., Johson, R., & Holubec, E. (2014). Cooperative learning in the classroom. Alexandria, VA: *Association for Supervision and Curriculum Development.*
- Kaleem, M., Tabassum, R., & Ullah, I. (2019). Effects of Peer Tutoring on the Academic Achievement of Students in the Subject of Biology at Secondary Level. *Education Science. 8*,112.
- Landrum, R. E., & Chastain, G. (1998). Demonstration tutoring effectiveness within a one-semester course. *Journals of College Student Development, 39*(5), 502-508.
- Lee, L.M., & Bush, T. (2003). Student mentoring in higher education: Hong Kong Baptist University. *Mentor: 11*, 263–271.
- MacDonald, R. B. (2000). *The master tutor: A guidebook for more effective tutoring* (2nd ed.). New York, NY: Cambridge Stratford.
- Madrid, L.D., Canas, M., & Ortega-Medina, M., (2007). Effects of team competition versus team cooperation in class wide peer tutoring. *J. Educ. Res. 100*, 155–160.
- Maheady, L. (2001). Peer-mediated instruction and interventions and students with mild disabilities. *Remedial & Special Education, 22*(1), 4-15
- Maheady, L., & Harper, G. (1987). A class wide peer tutoring program to improve the spelling test performance of low-income, third- and fourth-grade students. *Education and Treatment of Children, 10*, 120–133.
- Marshall, H., Valentic, G., & Rasmussen, S. (2019). Embedded Tutoring to Enhance Dialogic Feedback and Improve Student Self-Regulation. *Learning Assistance Review, 24*(2).
- Mastropierri, M., Scruggs, T., Spencer, V., & Fontana, J. (2003). Promoting success in high school world history: *Peer tutoring versus guided notes. Learning Disabilities Research & Practice, 18*(1), 52-65.
- Mehra, V., & Mondal, H.R. (2005). Effects of peer tutoring on learning outcomes of high school science students. *Indian Educ. 41–58.*
- Mepheron, M., & Nunes, M. B. (2013). The Role of Tutors as a Fundamental Component of Online Learning Support. *Distance and E-Learning in Transition, 235–246.* <https://doi.org/10.1002/9781118557686.ch16>
- Miller, A. S. (2003). *The Development of Critical Thinking in Adult Learners Using Multi logical Problems and Dialogical Instruction.* (Doctoral Dissertation). Walden University. Retrieved from Pro quest database.
- Mitchem, K.J., Young, K.R., West, R.P., & Benyo, J. (2001). CWPASM: A class wide peer-assisted self-management program for general education classrooms. *Educ. Treat. Child. (ETC) 24*, 111–140.
- Moreneo, C., & Duran, D. (2002). *Frameworks: Cooperative and Collaborative methods.* Barcelona, Spain: Edebe.
- Mumford, T.J. (1999). *The Effects of Student Support Services Peer Tutoring on Learning and Study Strategies, Grades, and Retention at a Rural Community College.* Ph.D. Thesis, Eastern Kentucky University, USA.
- Outhred, T., & Chester, A. (2010). The Experience of Class Tutors in a Peer Tutoring Programme: A Novel *Theoretical Framework, Australasian Journal of Peer Learning, 3*(1), 12-23.
- Oviawe, J.I. (2008). Effect of peer tutoring assisted instruction on students' academic achievement in introductory technology. *FCT Education Secretariat Journal of Curriculum Studies and instruction, 1*(1), 77-84.
- Pearson, P. D., & Johnson, D. D. (1978). *Teaching reading comprehension.* New York: Holt, Rinehart, & Winston.
- Philip, L., & Council, B. (2010). *Peer Tutoring: Students achievement, confidence and the teacher's role.* University of Nebraska-Lincoln, NE.

- Piaget, J. (1974). PartI: Cognitive development in children: *Piaget (1974) development and learning. J.Res. Sci. Teach.* 2, 176–186.
- Pugatch, T., & Wilson, N. (2018). Nudging study habits: *A field experiment on peer tutoring in higher education. Economics of Education Review*, 62, 151-161. <https://doi.org/10.1016/j.econedurev.2017.11.003>
- Rizve, R. (2008). *The Effect of Peer Tutoring on Student Achievement in the Subject of English at Secondary Level in the Light of Vygotsky's Theory*. Ph.D. Thesis, Foundation University, Islamabad, Pakistan, 2012.
- Russ, V. A. (2015). *The relationship between final grades and tutoring methods of at-risk college freshmen*. (Doctoral Dissertation, Walden University).
- Sandford, R.A., Armour, K.M., & Stanton, D.J. (2010), “Volunteer mentors as informal educators in a youth physical activity program”, *Mentoring and Tutoring: Partnership in Learning*, 18 (2), 135-153.
- Santee, J., & Gravalia, L. (2006). Peer tutoring programs in health professional schools. *American Journal of Pharmaceutical Education*, 70(3), 11-117.
- Saunders, D. (2002), “Peer tutoring in higher education”, *Studies in higher Education*, 17 (2), 211-218.
- Shabani, K., Khatib, M., & Ebadi, S. (2010). Vygotsky's Zone of Proximal Development: Instructional Implications and Teachers' Professional Development. *English Language Teaching*, 3(4), 237-248.
- Springer, L., Stanne, M., & Samuel, D. (1991). Effects of Small-Group Learning on undergraduates in Science, Mathematics, Engineering, and Technology: *A Meta-Analysis of Educational Research*, 69, 21-51.
- Smith, S. & Nicolai, D. (2013). *Guide for Tutors and Tutees*, 1st ed.; State University of New York: New York, USA.
- Stigmar, M. (2016). Peer-to-peer teaching in higher education: *A critical literature review. Mentoring & Tutoring: partnership in learning*, 24(2), 124-136. <https://doi.org/10.1080/13611267.2016.1178963>
- Topping, K. (2000). *Tutoring; International Academy of Education*: Geneva, Switzerland.
- Topping, K.J. (1996). The effectiveness of peer tutoring in further and higher education: *A typology and review of the literature. High. Educ.* 32, 321–345.
- Topping, K. J. (1996). The Effectiveness of Peer Tutoring in Further and Higher Education: *A Typology and Review of the Literature. Higher Education*, 32, 321-345. Retrieved from <http://dx.doi.org/10.1007/BF00138870>
- Tong, E. (2004). Tutoring aid tutors, learners. *Collaborative Learning*, 661, 253-257.
- Tudor, A. M. (N.D). *Peer Tutoring Handbook for Tutors and Mentor Teachers*. Tennessee High School, Bristol.
- Vasay, E.T. (2010). The Effects of Peer Teaching in the Performance of Students in Mathematics, *E- International Scientific Research Journal*, 2, 161-171.
- Vigotsky, L. S. (1989). *Fundamentals of Defectologia*. Havana City, Cuba: Pueblo and Education.
- Web, N., Nemer, K., & Ing, M. (2006). Small-group reflections: Parallels between teachers discourse and student-behavior in peer-directed groups. *Journal of the Learning Sciences*, 15(1), 63-119.