

## **Strategy of Peer Tutoring and Students Success in Mathematics: An Analysis**

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The study was designed to examine the effects of peer tutoring as a strategy of teaching on students' success in the subject of mathematics at secondary level. It was an experimental study and it followed pre-test post-test equivalent research design. The experiment was carried on 200 students from two different schools (boys and Girls). One hundred students were taken as sample from each of the school and on the basis of teacher made pre-test, students were randomly divided into experimental and control groups. The experiment lasted for eight weeks and post-test was taken to examine the effects of peer tutoring on students' academic achievement. An effort was made to control all other variable like academic and professional qualification of teachers, academic achievement of students, and socioeconomic status of students and teachers etc. It was found that peer tutoring brought about positive changes in the results of students in mathematics. It was concluded that peer tutoring strategy found fruitful in increasing the academic achievement of students who were weak and mediocre also. It was suggested that teachers may be trained to use peer tutoring as a strategy on regular basis for securing better results in academics at school level.

**Key words:** *peer tutoring, Mathematics, teaching strategy, students of secondary schools*

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### **Introduction**

Scruggs Mastropieri and Marshak (2012) defined peer tutoring as an instructional strategy in which students work in pair form to learn academic tasks in the class. It is teaching to other students by students in the classroom in the form of pairs to involve them in studies (Ryan & Deci 2000). A systematic peer mediated teaching strategies and peer tutoring are same (Rohrbeck, Ginsburg-Block, Fantuzzo & Miller 2003). Schloss, Schloss, and Schloss, (2007) elaborated it as an instructional strategy in which the peers play the role of teaching agent for their class fellows whereas Sporer and Brunstein (2009) stated that it is a strategy in which the students work in pairs and enhance their learning (Mayfield & Volmer 2007). It is a process of receiving knowledge and skill from classmates having same social group. According to Wadoodi and Crosby (2002) it is teaching strategy in which class is organized in pair of two students may be of

different abilities to act as tutor and tutee in learning process and to get maximum benefits from each other. Fuchs, Fuchs and Karns (2001) stated that the peer tutoring has encouraging effects on scholastic achievements of the students in Mathematics. Roscoe and Chi (2007) concluded that peer tutors use their existing knowledge as bases of new knowledge which is a fruitful activity for them. Schacter (2000) mentioned that when students work together their learning and academic achievement enhance or raise well.

Rohrbeck et al. (2003) pointed out effectiveness of peer tutoring for students of elementary classes (grades 1-3), in urban areas, in poor socio-economic areas and in controlled tutoring sessions. It is common practice to have students of diverse learning abilities in the classroom, which creates problem for teacher to give individual attention to them. Peer tutoring makes teacher able to enhance academic achievement of diverse ability

students in the classroom. Topping (2008) found no difference in effectiveness of same age tutors and cross age tutors. Further benefits of peer tutoring mentioned by Topping (2008) are higher academic achievement, improved peer relationship, improvement in personal and social development and enhanced motivation. Also teacher can pay individual attention to all students. Burnish, Fuchs and Fuchs (2005) when used peer tutoring for students with proper training of tutors, there was improvement in academics.

### **Literature Review**

Woolfolk (2010) explained the Piaget's and Vygotsky's idea of social interaction that peer-to-peer interaction motivates students to learn and social interaction causes learning. Siyepu (2013) stated that Vygotsky's idea of the Zone of Proximal Development provide theoretical ground for peer tutoring. Problem-solving with the help of peer having more ability than tutee permits children to enhance new areas of potential. Vygotsky named this new areas the leading edge of children's intellectual growth which represent zone of proximal development (ZPD), which formed when child work with mentor of high ability in a academically useful and dynamic ways. Zone of Proximal Development (ZPD) means the difference between the performance of students in learning activity with and without help of tutor. Piaget and Vygotsky focus on learning process instead of content, the learner creates own knowledge through different learning situations through active participation and engagement. The social constructivist view of learning focus the role of the students to produces learning ( the tutor and tutee ) through their zone of proximal development and instead of stimulus/response process students are actively participating in making learning through cognitive accommodation or absorption.

Kukla and Walmsley (2006) stated that the social constructivist learning theories provide the bases for learning through peer tutoring. Constructivist's educational philosophy stated that the new thoughts comes from the previous knowledge of the learners, hence most excellent education needs students' involvement. The constructivism further believes that learners create new ideas during interaction with other students having different point of view (Prawat & Floden,

1994). Summers as cited by Austin, (2008) quoted that the students use their knowledge and ability to help their classmates in studies in implementation of peer tutoring therefore, Peer tutoring is correlated with theory of social constructivism. Powell and Kalina (2009) stated that Social constructivism causes the learning through social interaction and conversation of the students within the active learning environment. In an active learning environment the tutor and tutee improve their social interaction through effective communication, which enhances peer relationship. Sometime the student could not understand the subject matter and its explanation by the teacher in the class, while his companion/comrade can explain him same thing in simple words. It is not only the information gathering but fundamental cognitive processes those are embedded or understood during communication. Hence both students involved in communication receive benefits. Peer tutoring is associated with these characteristics of social constructivist theory by enhancing social cooperation of the students (tutor and tutee). The knowledge building is promoted through communication and conversation, which is helpful for the tutees during implementation of peer tutoring. The tutee asks questions, formulates new challenges and feed back to tutor and gets benefits, while tutor benefits through answering and transmitting knowledge to tutee, it is what meant by who teaches, learns twice. Topping and Ehly (1998) elaborated theoretical model of peer tutoring that was related to cognitive development and socio-cultural theories. This model stated that the main reasons and causes were clear objectives and plan for tutor and tutee both, maximum engagement with task, individual attention for tutee, immediate feedback, pleasure and stimulation in a unique learning situation. The peer tutoring requires scaffolding and help from tutor which demands supervision of activities within the zone of proximal development.

### **Benefits of Peer Tutoring**

It is a common practice to teach over-crowded classes in our educational system with students of different ability level and needs. So it is a basic need of a teacher to have a competent way of teaching to address such issues. Costantini, (2015) mentioned that the peer tutoring is an effective intervention for improvement of content knowledge, and increase understanding of content (subject

matter). Class-wide peer tutoring is found to be effective in improving students' grades, increasing knowledge of subject matter, developing students' engagement and improving students' behavior in the class room. Peer tutoring to improve achievement level of students in the math, reading, vocabulary, social studies and English. Bowman-Perrott (2009) concluded that it provides one-one coaching during implementation. The students learn through teaching and earn opportunity to correct their errors. Also the students achieve their academic goals and improve their social relations all together. Bowman-Perrott, et.al (2013) said that Peer tutoring is useful in encouraging educational gains in course content, and is successful for students of elementary and secondary level classes. The rewards are beneficial in playing the role of motivator for students. Kroeger and Kouche (2006) used peer tutoring in PALS format for students of diverse learning abilities in mathematics in seventh grade class. The students regularly assist each other in solving mathematical problems. PALS proved itself supplement for students in weak area of the subject. The reciprocal role of tutor and tutee, having different achievement level provided an opportunity of teaching and explaining to weaker students. This makes them busy in practicing the mathematical problem. Kroeger and Kouche (2006) recommended the intervention for building confidence and engagement of weak students in the learning. Spencer, Scruggs and Mastropieri, (2003) found an encouraging increase in academic achievement and have a positive influence on learning environment by using peer tutoring. Olmscheid (cited by Horvath, 2011) as peer tutoring is an effective and ideal way to address all these issues. Also in peer tutoring students work in one-on-one pair which increases academic commitment in the class room. Kourea, Cartledge & Musti-Rao, 2007 and Topping (2005) cited by Horvath (2011) reported the effectiveness of peer tutoring on academic achievement of the students also. Peer tutoring helps teacher to engage all students of the class in learning activity according to their individual needs where he helps them at the spot.

Mastropieri, Scruggs and Graetz (2003) reported that Peer tutoring techniques are successful and effective for high school students with learning disabilities. Kourea et al. (2007) gave similar words

as Miller, Topping and Thurston (2010) pointed out the benefits for tutee during peer tutoring include effective learning, individual attention, free responding to his companion than teacher and friendship with peer. Also Peer tutoring is effective in achievement of learning outcomes and provides the learners an opportunity to enhance their social and behavioral abilities, including communicating, sharing and cooperating with each other in the classroom. Also it is effective to improve learner's self-esteem. Topping (2005) cited by Horvath (2011) suggested that Peer tutoring is very effective and helpful not only for low achievers or struggling students but also for gifted or high achievers. Topping, Miller, Thurston, McGavock and Conlin (2011) mentioned that there were more gains for students with low socioeconomic status than high socioeconomic status, more gains for average students and more gains for girls than boys. There is another fact, the weak students were not an active participant of the class but the peer tutoring helped them to make active participants of the class. Also peer tutoring enhances their tendency to share their views with their peers which they cannot share with their teachers (Maheady & Gard, 2010).

Loke and Chow (2007) pointed out another benefit of peer tutoring that it is tutor's own help through the process of teaching to their companion. When student assists other student in teaching learning process, self satisfaction and self-confidence were increased. Dvorak (2001) stated that peer tutoring causes improvement in understanding, better attitude towards learning, course content, enthusiasm and selection of career of the students. Peer tutoring creates a friendly learning environment in the class. Scruggs, et al., (2012) stated that the teacher can help students with diverse abilities to acquire master skills and knowledge by using peer tutoring otherwise traditional teaching system cannot provide individual learning, attention and speed. Okilwa and Shelby (2010) reported peer tutoring is effective for students with and without learning difficulties in local students of spoken English and English as language.

Goodlad (1999) stated that the students playing the role of (tutee) follow the lesson, enjoy the learning and take interest in lesson. The students playing the role of tutor can improve their

communication skill in peer tutoring. Also they feel themselves busy in useful knowledge activity, make themselves familiar with working of other students in particular subject. The self- confidence of the students (tutor and tutee) also increased. Their subject understanding and proficiency also improved during peer tutoring. The students learned more and the teacher enjoys their lesson.

### **Peer Tutoring in Mathematics**

Kiburis (2012) used Peer Tutoring in Peer Assisted Learning Strategy (PALS) format with some modification in 7<sup>th</sup> grade students of regular education in subject of Mathematics. The researcher found that the implementation of PALS math program for students increased their post-test scores in mathematics as compare to pre-test scores. PALS math provided additional support to students with diverse learning abilities. PALS provided an opportunity to engage all students in practicing Mathematics problems.

Hawkins, Masti-rao, Hughes, Berry, and McGuire (2009) used class-wide peer tutoring along with randomized interdependent group oriented contingency (IGOC) in a general education math classroom. The purpose of this intervention was to improve fluency of multiplication in mathematics. It was also found that Class-wide peer tutoring along with randomized interdependent group oriented contingency (IGOC) improved students performance in Mathematics. Lo and Cartledge (2004) also used class-wide peer tutoring along with randomized interdependent group oriented contingency (IGOC) in a general education 4<sup>th</sup> grade Social studies classroom. It was found that the intervention improved the grades of seven students out of eight students. Calhoon and Fuchs (2003) used Peer Assisted Learning Strategies (PALS) to find the effectiveness in the subject of mathematics at secondary level and concluded that the students involved in PALS program performed well and showed better understanding of the concepts of Mathematics.

Topping, Campbell, Douglas and Smith, (2003) as cited by Austin, (2008) reported that the student centered approaches enhanced the achievement of students in all subject at elementary level and the use of Mathematics in daily life. Therefore, the educational institutes are accepting the student centered approaches instead of traditional

methods of teaching. All the learners with different backgrounds showed remarkable gain in their learning because of implementation of same-age and cross-age tutoring. Topping, et al. (2003), used the concept of cross-age peer tutoring to find factors responsible for increasing achievement level in mathematics. It was found that the peer tutoring caused increase in the achievement level of mathematics and enhanced self confidence of both tutor and tutee. McMaster, Fuchs and Fuchs (2006) also found that motivation in a class of mathematics increased. The motivation helped the students to earn success in Mathematics. The research is the evidence of PALS as successful intervention in Mathematics class.

Austin (2008) concluded that the goal of achieving mastery in problem solving skill can be achieved through peer tutoring in the class room. The ability to solve problem is an important and fundamental component of teaching mathematics. The mastery of problem solving skill is basic need of students in daily life. Mastropieri et al., (2003) stated that Peer tutoring is not only effective and well organized way of enhancement and individual attention in curriculum at elementary level but also applied to middle and secondary level. Ginsburg-Block, Rohrbeck, and Fantuzzo, (2006) used PALS (Peer assisted learning) one of format of same age peer tutoring arranged for academic purpose and found academic improvement along with self concept and social improvement. Fuchs, Fuchs, Yazdin and Powell, (2002) concluded that the Peer Tutoring has a significant effect on Mathematics achievement. It was also pointed out that peer tutoring and cooperative learning strategies for students having learning disabilities in the subject of Mathematic and students improved their Mathematics score.

Dvorak (2004) suggested peer tutoring as a cost effective and beneficial technique for students at risk or having low grades in academic achievements, studying in schools using traditional lecture method. He recommended peer tutoring for all the students i.e. general population as it provides an opportunity to tutee to learn deeply. Peer tutoring is more useful and effective for students of diverse learning abilities. Also peer tutoring promotes active learning of academic contents. Topping, (2005) reported significant gain in academic achievement of students because of the use of peer

tutoring in classroom. Spencer (2006) revealed that Peer tutoring was found to be as an effective instructional strategy. The peer tutoring benefited students with emotional and behavioral disorders. Walker (2007) used the concept of peer tutoring in the subject of mathematics in a high school. The researcher used six high achieving students as tutors to use their knowledge to help those students who had poor understanding in mathematics. It was concluded that peer tutoring benefited both tutor and tutee to learn mathematical concepts. Parsons, Croft, and Harrison (2009) concluded that students worked together in peer tutoring and got high self concept and contentment to increase their confidence, and achievement level. Mesler (2009) worked on third grade students of an urban high school while using the concept of peer tutoring. Through peer tutoring both students (tutor and tutee) improved their math skills and showed good test scores at the end indicating increased achievement level. Rheinheimer (2000) also concluded improvements in grades of students who received five hours tutoring.

Dvorak (2001) stated that peer tutoring promoted chances for students to get their academic goals, scholarly development and put them to higher education. In contrast to lecture method, peer tutoring gives more opportunities to ask questions. As peer tutoring provides an opportunity to a student to teach the knowledge of subject matter to his classmate, it promotes the thinking level of student. Greenwood (1997) found that the peer relation between student and teacher is soft as compared to common classroom setting. In both general education and special education format, the peer tutoring was found to be fruitful and productive to improve academic and social skills in all students, particularly the poor learners.

### Objectives of the Study

Following were the objectives of this research study;

1. To examine the effect of peer tutoring on academic achievement of male students in the subject of Mathematics at secondary classes
2. To examine the effect of peer tutoring on academic achievement of female students in the subject of Mathematics at secondary classes

3. To compare the effect of peer tutoring on academic achievement of male and female students in the subject of Mathematics at secondary classes
4. To compare the effect of peer tutoring on academic achievement of high achievers/low achievers male and female students in the subject of Mathematics at secondary classes

### Hypotheses

Following hypotheses were developed in order to guide the study;

$H_0$ : There will be no significant difference in the academic achievement of male students who will be taught through peer tutoring as a teaching strategy and those students who will not be taught through peer tutoring as a teaching strategy.

$H_1$ : There will be a significant in the academic achievement of male students who will be taught through peer tutoring as a teaching strategy and those students who will not be taught through peer tutoring as a teaching strategy.

$H_0$ : There will be no significant difference in the academic achievement of female students who will be taught through peer tutoring as a teaching strategy and those students who will not be taught through peer tutoring as a teaching strategy.

$H_1$ : There will be a significant in the academic achievement of female students who will be taught through peer tutoring as a teaching strategy and those students who will not be taught through peer tutoring as a teaching strategy.

$H_0$ : There will be no significant difference in the academic achievement of male and female students who will be taught through peer tutoring as a teaching strategy and those male and female students who will not be taught through peer tutoring as a teaching strategy.

$H_1$ : There will be a significant in the academic achievement of male and female students who will be taught through peer tutoring as a teaching strategy and those male and female students who will not be taught through peer tutoring as a teaching strategy.

$H_0$ : There will be no significant difference in the academic achievement of (high/low achievers) male

and female students who will be taught through peer tutoring as a teaching strategy and those (high/low achievers) male and female students who will not be taught through peer tutoring as a teaching strategy.

*H<sub>1</sub>*: There will be a significant in the academic achievement of (high/low achievers) male and female students who will be taught through peer tutoring as a teaching strategy and those (high/low achievers) male and female students who will not be taught through peer tutoring as a teaching strategy.

### **Methodology**

Experimental study is defined as procedures in quantitative research in which the researcher determines whether an activity or materials make any difference in results for participants. When the researcher desires to discover a potential cause and effect between dependent and independent variables, an experimental design is used. In the experimental design the experimental group receives the experimental treatment, whereas those in control group do not (Creswell, 2011). This research study was structured on randomized control-group pretest post-test design because of equating the groups through random assignment, application of pre-test, teaching through peer tutoring as a teaching strategy (treatment) and application of post-test to examine the difference in academic achievement of students.

### **Population**

210 students studying in four sections (53, 50, 50, 57) each of 10<sup>th</sup> class of Government Centennial Model Higher Secondary School (Boys) A, and 159 students studying in three sections (50, 50, 59) each of 10<sup>th</sup> class of Government Girls Higher Secondary School B, in district Haripur were population of the study.

### **Sample**

A group of 100 students from English medium 10<sup>th</sup> class of Secondary School (A) and 100 students of Secondary School (B) in district Haripur were taken as sample of the research study.

### **Instruments**

Before starting the experiment the researcher conducted pre-test for all sample students (both male and female). On the basis of result in pre-test the researcher equated experimental and control groups in both schools. For this purpose the

researcher arranged the results of the sample students in descending order. The arranged result of boys and girls further divided into set of fifty high achievers and fifty low achievers each. The researcher randomly assigned twenty five high achievers each to experimental and control group boys and girls separately. Finally both experimental and control groups were containing fifty student each in boys and girls.

The researcher made pair of one high achiever (tutor) and one low achiever (tutee) randomly to conduct experiment. Two research tools were developed for the purpose of research study. The researcher constructed 70 items all multiple choice questions having four options with one correct answer from the text book of 9<sup>th</sup> class Mathematics and presented them to secondary school Mathematics teachers for their validity opinion. The researcher also got opinion from subject specialist (Mathematics) to ensure the validity of the test. Changes were made in selected items to enhance the validity. After deletion and addition in items, final test contained fifty items. The researcher constructed 72 items all multiple choice questions with four options having one correct answer from first three units including i. Quadratic Equations, ii. Theory of Quadratic Equations, and iii, Variations, from text book of 10<sup>th</sup> class Mathematics and presented them to secondary school Mathematics teachers for their validity opinion. The researcher also got opinion from subject specialists of Mathematics to ensure the validity of the test. Changes were made in selected items to enhance the validity. The researcher finalized fifty items in the post-test. In order to check the reliability of the tests pre-test was piloted on fifty students of 10<sup>th</sup> class in Government high school (Boys) sector # 4 Khalabat town ship. The reliability was measured by using Pearson formula. The calculated value of reliability for Pre-test was 0.705. In order to check the reliability of the post-test, it was piloted on fifty students of 10<sup>th</sup> class in Government high school (Boys) sector # 2 Khalabat town ship. The reliability was measured by using Pearson formula. The calculated value of reliability for Post-test was 0.784.

### **Treatment**

The experiment was conducted for eight weeks. During experiment first three chapters of

syllabus of mathematics for 10<sup>th</sup> class were taught to both control and experimental groups. The researcher took the responsibility of teaching experimental group boys to apply peer tutoring strategies in the classroom and assigned same responsibility to female Mathematics teacher to teach experimental group in girls school. The researcher made it sure to train female teacher of Mathematics in proper application of peer tutoring strategy. The researcher and the female teacher used peer tutoring for experimental group for forty minutes daily while other two teachers of Mathematics taught control groups of both schools through traditional method.

The researcher/teacher of experimental group explained the concept for first ten (10) minutes. Then researcher/teacher assigned task (questions) from exercises related to the concept to students of experimental group during implementation of intervention. The tutors solved and explained the question to tutees and asked tutees to repeat the same. Tutors immediately gave feedback at the work of tutees, prompt the mistakes and corrected them. After correct response of the tutee, tutor solved next problem. In case of failure or incorrect response of tutees, the tutors repeated the same practice. This practice continued for fifteen (15) minutes. During each session of treatment the tutors and tutees switches their role after fifteen (15)

minutes. The tutees got the role of tutors and did the same work for next fifteen (15) minutes. In the last five (05) minutes the teachers highlighted the performance of the pairs. The same practice was used by female math teacher during experiment in girl’s classroom. The researcher collected data twice, before the start of experiment and after the completion of experiment. The researcher conducted pre-test in both schools before experiment. The marks of the sample students were first set of data. The researcher conducted post-test in both schools after treatment for the collection of data.

**Data Collection and Analysis:**

After collection of data through pre-test, the researcher used SPSS and equated experimental and control groups. After collection of data through post-test, the researcher used SPSS for the analysis of data. There was one independent variable (peer tutoring) and one dependent variable (academic achievement) that’s why it was seem feasible to use t-test for comparison. For finding effect of intervention (peer tutoring), the researcher compared the mean of the students’ of the both experimental and control groups and applied t-test through SPSS. The researcher also compared the mean value of scores achieved by experimental group boys and experimental group girls. Then the researcher compared the mean scores of high achievers and low achievers students of both groups.

**Results**

**Table 1**

*Comparing Experimental and Control Groups (Girls in Pre-test)*

Category	N	Mean	SD	t-value	P
Experiment:	50	18.68	6.19	-0.16*	0.99
Control	50	18.70	6.11		

\*Significance

Table 1 elaborated the mean score, standard deviation, t-value and significance. For N=50 the mean score of experimental group was 18.68 with

SD 6.19 while mean of control group was 18.7 with SD 6.11 and the calculated value of t was -0.016 and

p was 0.99. As  $p > 0.05$  therefore, difference was not found statistically significant among the groups.

**Table 2**

*Comparing Experimental and Control Groups (Boys in Pre-test)*

Category	N	Mean	SD	t-value	p
Experiment:	50	16.04	5.44	0.47*	0.64
Control	50	15.52	5.45		

\*Significance

Table 2 elaborated the mean score, standard deviation, t-value and significance. For N=50 the mean score of experimental group was 16.04 with SD 5.44 while mean of control group was 15.52 with

SD 5.44 and the calculated value of t was 0.478 and p was 0.64. As  $p > 0.05$  therefore, difference was not found statistically significant among the groups.

**Table 3**

*Comparing Boys and Girls of Experimental Group in Pre-test*

Category	N	Mean	SD	t-value	p
Girls	50	18.68	6.20	2.26*	0.02
Boys	50	16.04	5.44		

\*Significance

Table 3 elaborated the mean score, standard deviation, t-value and significance. For N=50 the mean score of experimental group Girls was 18.68 with SD 6.20 while mean of experimental group Boys was 16.04 with SD 5.44 and the calculated

value of t was 2.26 and p was 0.02. As  $p < 0.05$ , therefore, difference was found statistically significant among (Girls and Boys) of experimental groups.

**Table 4**

*Comparing Experimental and Control Group Girls in Post-test*

Category	N	Mean	SD	t-value	p
Experiment:	50	28.94	5.87	9.43*	0.00
Control	50	18.62	5.07		

\*Significance



Table 4 elaborated the mean score, standard deviation, t-value and significance. For N=50 the mean score of experimental group was 28.94 with SD 5.87 while mean of control group was 18.62 with

SD 5.07 and the calculated value of t was 9.43 and p was 0.00. As  $p < 0.05$  therefore, difference was found statistically significant among the groups. The researcher was failed to accept the null hypothesis.

**Table 5**

*Comparing Experimental and Control Group Boys in Post-test*

Category	N	Mean	SD	t-value	p
Experiment:	50	19.98	4.58	6.97*	0.00
Control	50	14.44	3.63		

\*Significance

Table 5 elaborated the mean score, standard deviation, t-value and significance. For N=50 the mean score of experimental group was 19.98 with SD 4.58 while mean of control group was 14.44 with

SD 3.63 and the calculated value of t was 6.97 and p was 0.00. As  $p < 0.05$  therefore, difference was found statistically significant among the groups. The researcher was failed to accept the null hypothesis.

**Table 6**

*Comparing Boys and Girls of Experimental Group in Post-test*

Category	N	Mean	SD	t-value	p
Girls	50	28.94	5.87	8.51*	0.00
Boys	50	19.98	4.58		

\*Significance

Table 6 elaborated the mean score, standard deviation, t-value and significance. For N=50 the mean score of experimental group girls was 28.94 with SD 5.87 while mean of experimental group boys was 19.98 with SD 4.58 and the calculated

value of t was 8.51 and p was 0.00. As  $p < 0.05$  therefore, difference was found statistically significant among the groups. The researcher was failed to accept the null hypothesis.

**Table 7**

*Comparing High Achievers of Experimental and Control Group Girls in Post-test*

Category	N	Mean	SD	t-value	p
Experiment:	25	33.68	4.14	10.21*	0.00
Control	25	22.64	3.47		

**\*Significance**

Table 7 elaborated the mean score, standard deviation, t-value and significance. For N=25 the mean score of high achievers in experimental group girls was 33.68 with SD 4.14 while mean of high achievers in control group girls was 22.64 with SD

3.47 and the calculated value of t was 10.21 and p was 0.00. As  $p < 0.05$  therefore, difference was found statistically significant among the groups. The researcher was failed to accept the null hypothesis.

**Table 8**

*Comparing Low Achievers of Experimental and Control Group Girls in Post-test*

Category	N	Mean	SD	t-value	p
Experiment:	25	24.20	2.53	12.79*	0.00
Control	25	14.60	2.77		

**\*Significance**

Table 8 elaborated the mean score, standard deviation, t-value and significance. For N=25 the mean score of low achievers in experimental group girls was 24.20 with SD 2.53 while mean of low achievers in control group girls was 14.60 with SD

2.77 and the calculated value of t was 12.79 and p was 0.00. As  $p < 0.05$  therefore, difference was found statistically significant among the groups. The researcher was failed to accept the null hypothesis.

**Table 9**

*Comparing High Achievers of Experimental and Control Group Boys in Post-test*

Category	N	Mean	SD	t-value	p
Experiment:	25	23.40	4.12	6.01*	0.00
Control	25	17.00	3.36		

**\*Significance**

Table 9 elaborates the mean score, standard deviation, t-value and significance. For N=25 the mean score of high achievers in experimental group

boys was 23.40 with SD 4.12 while mean of high achievers in control group boys was 17.00 with SD 3.36 and the calculated value of t was 6.01 and p

was 0.00. As  $p < 0.05$  therefore, difference was found statistically significant among the groups. The

researcher was failed to accept the null hypothesis.

**Table 10**

*Comparing Low Achievers of Experimental and Control Group Boys in Post-test*

Category	N	Mean	SD	t-value	p
Experiment:	25	16.56	1.23	12.45*	0.00
Control	25	11.88	1.42		

\*Significance

Table 10 elaborated the mean score, standard deviation, t-value and significance. For N=25 the mean score of low achievers in experimental group boys was 16.56 with SD 1.22746 while mean of low achievers in control

group boys was 11.88 with SD 1.42361 and the calculated value of t was 12.45 and p was 0.00. As  $p < 0.05$  therefore, difference was found statistically significant among the groups. The researcher was failed to accept the null hypothesis.

**Table.11**

*Comparing High Achievers Boys and girls of Experimental Group (Post-test)*

Category	N	Mean	SD	t-value	p
Girls	25	33.68	4.14	8.80*	0.00
Boys	25	23.40	4.12		

\*Significance

Table 11 elaborated the mean score, standard deviation, t-value and significance. For N=25 the mean score of High Achievers in Experimental group Girls was 33.68 with SD 4.14 while mean of High Achievers in Experimental

group Boys was 23.40 with SD 4.12 and the calculated value of t was 8.80 and p was 0.00. As  $p < 0.05$  therefore, difference was found statistically significant among the groups. The researcher was failed to accept the null hypothesis.

**Table.12**

*Comparing Low Achievers Girls and Boys of Experimental Group (Post-test)*

Category	N	Mean	SD	t-value	p
Girls	25	24.20	2.53	13.57*	0.00
Boys	25	16.56	1.23		

\*significance

Table 12 elaborates the mean score, standard deviation, t-value and significance. For N=25 the mean score of low achievers in experimental group girls was 24.20 with SD 2.53 while mean of low achievers in experimental group boys was 16.56

### Discussion

Results showed that the experimental and control group were equated properly for conducting experimental research, in male and female secondary schools. The competence level (caliber) of both groups was same before the start of experiment. The equal achievement level provide strong base to find the influence intervention during the experiment. The first null hypothesis accepted. Results showed that the peer tutoring made positive impacts on the students' achievement. Peer tutoring improved the achievement level of the experimental group of the both male and female students. They performed well as compare to control group. The results of the study are aligned or similar to the result reported by Fuchs, et al. (1997) for significant academic improvements using Peer Mediated instructional group (PMI) over non-Peer Mediated instructional group (PMI) group. The results of this study treatment (peer tutoring) has a significant effect on mathematics achievement is same as the studied by Kiburis, (2012), Fuchs, Fuchs, Yazdin and Powell, (2002). Okilwa and Shelby (2010) reported positive academic achievement for students in general education and special education systems. Dvorak, (2004) also noted positive impact of peer tutoring on students of learning disabilities.

Results showed that the performance of girls (experimental group) found better than the boys (experimental group). Also from results it was found that in the performance of girls (high achievers) better than boys (high achievers) of experimental group. Similarly low achievers girls performed well than low achievers boys in experimental group. The result of the study shows more gains for girls as compare to boys are aligned with Topping et al., (2011). Results showed that peer tutoring caused improvement in achievement level of high achievers students of experimental group in both male and female students. The results of the study for high achievers students are similar to the study by Topping (2005). Results showed that peer tutoring caused improvement in achievement level of low achievers students of experimental group in both male and female students than low achiever students

with SD 1.23 and the calculated value of t was 13.57 and p was 0.00. As  $p < 0.05$  therefore, difference was found statistically significant among the groups. The researcher was failed to accept the null hypothesis.

of control group. The results of the study for low achievers similar to Topping et al., (2011) and as a whole increase in academic achievement are aligned to studies Topping (2008) and Mastropieri et al., (2003). Similar notion was also explained by Kunsch, Jitendra, & Sood (2007) to whom peer tutoring works effectively for at risk students or students facing problem in subject of mathematics or having disabilities in mathematical content. The students working in a Peer tutoring format show remarkable gain in academics if they are different according to their achievement level during practice of mathematical problems or other learning tasks.

The study showed results aligned to Hawkins, et.al (2009), who concluded that class-wide peer tutoring along with randomized interdependent group oriented contingency (IGOC) improved students' performance in mathematics. As present study was conducted on secondary level showed same results of Calhoon and Fuchs, (2003), who used Peer Assisted Learning Strategies (PALS) in secondary level mathematics. The promising improvement in scores of low achiever students in both male and female groups showed peer tutoring effective for weak students as concluded by House and Wohlt (1989). The study conducted by Dvorak (2004) also supported the results of this study for weak or low achieving students.

### Conclusion and Recommendations

It was concluded that the difference in academic achievement of experimental and control groups of male and female students in pre-test was not significant which showed that groups were equated properly before the start of intervention (teaching through peer tutoring strategy). It was also concluded that the difference in academic achievement of experimental and control groups of male and female students in post-test was significant which showed that peer tutoring made positive effect on student's achievement. It provided a strong base to recommend that peer tutoring may be applied on regular basis as a strategy in classroom teaching. Teachers may be trained and encouraged in using

peer tutoring strategy in an effective way. Teachers of all levels of schools (primary to secondary) may be trained in developing good understanding of students of different capacities for pair making process. Both boys and girls students of low academic achievement in pre test also reflected good results in post test after treatment and this evidence helped us conclude that peer tutoring was a better teaching strategy for low achiever students. It was also recommended that peer tutoring strategy may also be applied to bring about positive changes in the results of low achievers. This strategy helped the students in learning the concepts as per their own pace, pause during learning process, and above all learning from a person having similar mental level. It was recommended that peer tutoring strategy may not only be applied in teaching mathematics but it can also be used in other subjects as well.

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