

## **Effectiveness of Peer Tutoring on The Academic Achievements of Tutors and Tutees With Respect to Knowledge, Comprehension and Application Levels of Cognitive Domain**

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Peer tutoring provides an opportunity to students of diverse abilities to work on academic tasks in pairs, in a democratic, cooperative and friendly approach. In this context, the study was an attempt to analyse how peer tutoring played the said role in enhancing the academic achievements of tutors and tutees at secondary level in reference to the key levels (knowledge, comprehension and application) of the cognitive domain. The study explored data from 40 purposefully selected participants of ANSI school Mardan, by applying the Pre-test Post-test Equivalent Group Design and conducting achievement tests before and after the treatments in order to accomplish the target objectives. The analysis of the data through inferential statistics (t-test) confirmed that though the tutors of the experimental group achieved better score at knowledge and application levels of the cognitive domain; however, they were not better in the comprehension level on post-test in compare to the high achievers of the control group. In the same way, the performance of the tutees of the group under investigation was significantly better with regards to academic ability, knowledge and comprehension at cognitive domain; however, at the application level there was no significant difference as compare to their correspondent low achievers of the controlled group. In the light of the findings it was concluded that the academic performance of the tutors as well as the tutees was significantly affected by peer tutoring.

**Keywords:** application; comprehension; knowledge; tutees; tutors; peer tutoring

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Contribution of Authors

1. Dr. Irfan Ullah has contributed in conducting, Structuring and Streamlining the Paper
2. Dr. Muhammad Kaleem has contributed in data collection and data analysis.
3. Dr. Syed Muhammad Amir has made necessary revision and language correction.

The effectiveness of peer tutoring as a technique for delivering instruction may be considered in the sense that it let students of diverse needs pair with each other to work on academic tasks in a friendly environment in order to enhance academic achievements (Tiwari, 2014). In this approach, students of diverse intellectual abilities depend on each other for academic learning especially in performing difficult tasks. The main theme of the peer tutoring is to focus individual needs of the learner which may not be usually considered in other conventional instructional strategies. The advantages of peer tutoring proceed in favor of both tutor and tutees in positive direction (Amaka, 2013).

In peer tutoring the students are paired with different or same grade level and sometime with parents or volunteers from outside the school (Kim, 2015). The study under investigation is based on same age peer tutoring in whom the difference between tutor and tutees is only intellectual abilities. Similarly, Smith and Nicolai (2013) affirmed that the positive aspect of peer tutoring is that it promotes tutors in enhancing his knowledge and skill of teaching; in response the tutees may also work collaboratively.

Furthermore, peer tutoring is an efficient approach for completing the course contents on time in a situation when teachers are limited and time is short, especially in case of mathematics (Henson, Hagos, & Villapando, 2009). According to Gordon (2008) peer tutoring develops creativity and intellectual abilities of both tutors and tutees, if the tutoring sessions are arranged in a planned and structured way. Some weak points related to management and administration of the peer tutoring were identified by Brost (2011). Therefore, he had recommended highly managed and supervised environment for conduction of peer tutoring.

Academic progress of a student is usually determined by his/her peer group and it is found more effective in case of female students. High academic performance is noted among the students whose colleagues have strong trends towards education as compared to those whose friends have strong approach towards social activity (Nwakoby, 2008).

Bloom, Krathwohl and Harrow categorized the learning of students in three main domains (cognitive, psychomotor and affective) in the form of educational outcomes. The teacher should know the level of the objective of instruction before going to deliver his/her lecture which may enable him/her to design his/her lesson plan accordingly (Iqbal, 2010).

Cognitive domain is related to mental/cognitive process of an individual which was further categorized by Bloom into six sub-stages of learning (IACBE, 2015). The lowest scale of learning is knowledge, in which students become able to remember something which was learned previously. In the level of comprehension students become able to reproduce something in other form from their own mindset; and at the level of application students become able to use their own learning experience in new circumstances. At the level of analysis, students can break their learning into its parts and understand the relationship among the parts. Similarly, at the level of synthesis, students become able to collect various components and can develop a new structure; while at the level of evaluation, students gain the ability of judgments (Bloom, 1956).

Different approaches are adopted to enhance the academic scores of the students especially at secondary level, which may enable them to gain admission in high reputed colleges. High scores of the students also represent the intelligence and hard work of the students. The methods of teaching which enable the students to gain high marks, are usually appreciated. In this connection, according to Khattak (2012), peer tutoring is the method which can improve academic learning.

Among different approaches of instruction, peer tutoring is the economical method which could enhance the rate of academic achievements of students and may easily fulfil individual needs of the students (Mushtaq & Khan, 2010). As mentioned by (Galaviz, 2009; Smith, 2010), peer tutoring should not be allowed unsupervised and without planning; hence, the researcher conducted the study in a supervised and controlled environment.

### **Literature Review**

The phenomenon of learning is under discussion from the last 2000 years ago. The members of different schools of thought have explained this phenomenon through logical justification which causes the development of concepts of empiricism and rationalism (Hammond, Austin, Orcutt, & Rosso, 2001). According to the theory of Skinner, the learning of an individual can be conditioned with some external stimulus. Teacher can condition the learning of students by linking their learning with some external stimulus and controlling other unrelated stimuli. On the basis of this theory the performance of the participants of peer tutoring can be improved by rewarding good performers or making pairs of two friends who have emotional attachment with each other (Redzuan, Boty & Shahrill 2014).

Piaget advocated that children learn new things by adaptation, using their background knowledge (Blake & Pope, 2008). According to his theory, children's knowledge construct is shaped by adjusting the new information in the frame of knowledge which is already available in their minds. According to the theory, tutor/mentor/teacher should manage the learning like a make-up designer or stage-sitter to polish and enhance skills of the learners. The learners should be allowed to fully participate in the learning process in which they can use their cognitive abilities; however, teaching everything hinders creativity. Piaget had given the name of reconstruction to the learning process (Lutz & Huitt, 2004). Piaget's theory favours the learning of tutors as well as tutees during their involvement in the preparatory sessions of peer tutoring in the pre and post-tests. According to Rizvi (2012), in the interactive sessions, peer tutoring improves the planning skills and the cognitive competence of both tutors and tutees accordingly.

Vygotsky supported peer tutoring implicitly. In his short life, he introduced the three zones of intellectual development and the theory of socio-culture. He advocated that peer tutoring is an effective approach in the zone of proximal development. He further affirmed that the zone of proximal development is usually described as, "*the distance between the actual development level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peer*". He also stressed upon the importance of culture, social interaction and historical background in their significant role in developing the intellectual abilities (Blake & Pope, 2008). The zone of proximal development manifests the level of learning ability in which the students need scaffolding, which may be provided by an experienced colleague or a teacher. Vygotsky proclaims when children are engaged with colleagues better in intellectual abilities within the zone of proximal development, they may easily internalize the concepts as compare to learning through instruction passively (Shabani,

Khatib, & Ebadi, 2010). That is the reason that Vygotsky supported peer tutoring as a useful approach for tutees as well as for tutors. Vygotsky also acknowledged that peer tutoring does well in case of children having some problems or disabilities when engaged with more competent partners (Ali, Anwer, & Jaffar, 2015). Vygotsky further classified the children into three categories on the basis of individual differences (Vygotsky, 1987). According to him, one group of students represent those who may easily comprehend the lecture and do not need any further assistance. Such students are grouped in the zone of actual development. Second group of students are those who cannot pick the idea of lecture from teacher and needs some further assistance. Such students are grouped in the zone of proximal development. Vygotsky recommended peer tutoring, home tuition and group discussion for this group of students (Daniels, 2016). Here peer tutoring is beneficial for both tutor and tutees. The cognition of the tutors is developed by preparation of lesson and responding to the tutees' questions while the learning of the tutees is developed in the shape of providing opportunities for free discussions and asking questions. The third group of students are those who are incapable to understand something even with the provision of external help. These students are grouped in the zone of no development (Mehra & Mondal, 2005).

Mehra and Mondal (2005) studied the influence of peer tutoring with reference to the academic efficiency in relation to knowledge and comprehension stages of learning in the subject of science of grade 9<sup>th</sup> students. According to the researchers peer tutoring is the strategy which can address the individual needs of the learner. Peer tutoring was proved useful in promoting the knowledge and comprehension levels of cognitive domain. Vogel, Fresko and Wertheim (2007) carried out a descriptive study on tutoring in Israel by collecting responses from college and university students with disabilities. The study discovered that both tutors and tutees were faced with problems of attention and coordination. The researcher found the tutees satisfied with the process of tutoring for the preparation of examination; but the tutors complained about some issues due to lack of appropriate skills. The study supported the findings of other researchers that peer tutoring can enhance academic efficiency in the stages of cognition.

According to Kiuru (2008) when the members in peer tutoring belong to same age and grade, they show resemblance in the selection of course contents, educational achievements and other activities in life. In contrast, students of dissimilar attributes are less advantageous in both educational and social context. Smith (2010) worked on the significance of peer in the life of children. Observation, discussion and interview were used for data collection. It was found that young tutors effectively played their roles and used different methods and tactics for satisfying their tutees but discipline problems were observed because of loose management. Brost (2011) examined the programme of peer tutoring in the Technical college of Chippewa Valley in Claire. It was concluded from the study that programme of peer tutoring was found effective and can further be improved by devising proper structure and prior planning on the part of tutors or management. According to Holecek (2012), the learning of basic mathematics can be improved in children having cognitive disabilities by providing tutors from upper grades having command on mathematics.

Rizve (2012), proved experimentally in the light Vygotsky theory that the academic learning of children within the zone of proximal development can be enhanced if they are provided with peer tutoring. Ezenwosu and Nworgu (2013) also reached the same results; however, their findings supported male students. Reitz, et al., (2014) showed the role of peers in the personality

development. The researchers also claimed that existed variations in personality of individuals are also caused by peer relations. The researchers supported their claim by providing authentic empirical studies. Through the strategy of scaffolding in the shape of peer tutoring by 7th grade students, it was observed that the students of the 5<sup>th</sup> grade performed better in the comprehension and understanding of English literature. The researchers also observed a positive change in attitude and participation rate towards learning (Haider & Yasmin, 2015).

Similarly, Abdelkarim and Abuiyada (2016) examined the achievement scores in mathematics through peer tutoring of the female undergraduate students of Dhofar university Oman. The experimental group delivered better score after having being engaged in peer tutoring in contrast to the control group; hence, unlike traditional approaches, the effectiveness of peer tutoring as an instructional startegy was proved.

Considering the aforementioned discussions, the study was designed to investigate and thus determine how effective peer tutoring was effective in connection to the academic achievements of tutors and tutees with regards to three levels "*knowledge, comprehension and application*" of the cognitive domain so as to achieve the following objectives and test the related hypotheses.

### **Study Objectives**

1. To investigate the effectiveness of peer tutoring on the academic accomplishments of tutors and tutees with reference to "*knowledge*" level of the cognitive domain of Bloom taxonomy.
2. To inspect the effectiveness of peer tutoring on the academic attainment of tutors and tutees with regard to "*comprehension and application*" level of the cognitive domain of Bloom taxonomy.
3. To determine the effectiveness of peer tutoring on the academic accomplishment of tutors and tutees with regard to "*application*" level of the cognitive domain of Bloom taxonomy.

### **Hypotheses**

The following hypotheses were developed for testing the above objectives;

- H<sub>0</sub>1: No significant effect of peer tutoring is observed on the academic accomplishments of tutors and tutees with respect to "*knowledge*" level of cognitive domain.
- H<sub>0</sub>2: No significant effect of peer tutoring is noted on the academic attainments of tutors and tutees with regard to "*comprehension*" level of cognitive domain.
- H<sub>0</sub>3: No significant effect of peer tutoring is noted on the academic accomplishments of tutors and tutees with regard to "*application*" level of cognitive domain.

## **Method**

### **Design**

Since the study was experimental, hence, pre-test post-test equivalent group design was utilized. This design was selected to reduce other peripheral threats to the treatment (Creswell, 2015).

### **Population**

433405 boy students of 10th grade of secondary level of the province of Khyber Pakhtunkhwa (EMIS, 2015) constituted the population of the study

### **Sample**

ANSI, a higher secondary school in private sector in district Mardan was chosen as site for the study. The selection of school was based on the personal relation of the researcher with administration and partly because the study was experimental which involved disturbance of normal setup for six weeks, and thus no other school was agreed to allow this scenario. There were round about 110 students studying in grade 10<sup>th</sup> in four sections, 10<sup>th</sup> Green, 10<sup>th</sup> Yellow, 10<sup>th</sup> Blue, and 10<sup>th</sup> White. The administrator of the school permitted the researcher for his experiment in two classes, 10<sup>th</sup> Green and 10<sup>th</sup> Yellow to avoid disturbance of the whole section. Forty seven students were studying in these two sections while seven students decline to participate. So forty 40 participants were left and were agreed to participate as sample of the study. Then on the basis of the scores of pre-tests and through pair random sampling, the sample was divided into two groups (experimental and control group) of equal nature. Both groups were divided further into two groups on their median scores' basis i.e. one group above the median and another below the median. Thus, two groups: the group of low achievers and the group of high achievers were formed. High achievers of the investigational group were nominated as tutors while low achievers were assigned the roles of tutees. Tutors were given proper instruction and training on the basis of the nature of contents to be presented for treatment.

### **Research Instruments**

Data (prior to treatment) was collected through pre-test which was developed in the already taught contents. Its reliability was calculated through split half method which was 0.92. Similarly, after the treatment, further data was collected through post-test. Its reliability was 0.70 which was considered satisfactory. It was ensured that these tests were in line with the three target levels of cognitive domain of the said taxonomy.

### **Treatment**

After group-formation, experimental group was exposed to peer tutoring on one hand and control group was being taught using the method of lecture demonstration on the other hand. The contents of the tutoring sessions were taught one day earlier to the tutors by the same instructor, who also taught to control group. 30 lesson plans were developed in advance in the three chapters (Inheritance, Biotechnology and Man and his Environment) of 10<sup>th</sup> grade biology. Every session was planned and organized by the researcher to avoid misbehaviours of the students. In order to avoid the effects of extraneous variables, other activities of students' assessments were suspended in the whole period of treatment. After completion of treatment period, post-test was conducted from both groups.

### **Data Collection**

Pre-tests were taken from the participants before conduction of treatment. Their scores were organized in descending order. The sample was then split into the same groups through pair random technique. A period of seven weeks was utilized as treatment phase by the students of experimental group during their involvement in peer tutoring. The teachers taught the control group through lecture demonstration method for the same period. Post-tests were taken from both the groups at the end of treatment so as to measure and assess the effectiveness of peer tutoring.

**Analysis of Data**

Data obtained from post-test were analysed through independent sample t-test.

**Results**

The data obtained from post-test were analysed statistically through independent sample t-test and 0.05 was set as level of significance.

**Table 1**

*Effect of peer tutoring with regard to tutors' knowledge level of cognitive domain*

GROUP	N	Mean	S D	SE <sub>D</sub>	T-value
Investigational	10	22.3	2.66	1.63	2.56
Control	10	18.1	4.44		

df = 18                      table value at 0.05= 2.101

The higher mean score of the investigational group is an indication of the better performance of their tutors in connection to the level of knowledge. On the basis of standard deviation, the investigational group highlights less variation in contrast to the control group. The higher calculated t-value is an indication of the rejection of the null hypothesis.

**Table 2**

*Effect of peer tutoring with regard to tutors' comprehension level of cognitive domain*

GROUP	N	Mean	S D	SE <sub>D</sub>	T-value
Investigational	10	8.8	1.81	0.66	0.75
Control	10	8.3	1.05		

df = 18                      table value at 0.05= 2.101

The mean values (8.80) and (8.3) shown by the investigational group and the control group respectively, highlights a negligible difference in connection to the comprehension levels of the two groups. On the basis of standard deviation, the control group highlights less variation. The less calculated t-value supports the null hypothesis.

**Table 3**

*Effect of peer tutoring with respect to tutors' application level of cognitive domain*

GROUPS	N	Mean	S D	SE <sub>D</sub>	T-value
Investigational	10	8.2	2.34	1.07	2.42
Control	10	5.6	2.45		

df = 18    table value at 0.05= 2.101

The higher mean value of investigational group portrays that their tutors performed well in the academic ability with regards to level of application of the cognitive realm. The value of standard deviation indicates that experimental group revealed less variation than its opposite group. The higher calculated t-value supports the rejection of null hypothesis.

**Table 4***Effect of peer tutoring with regard to tutees' knowledge level of cognitive domain*

Groups	N	Mean	SD	SE <sub>D</sub>	t-value
Investigational	10	18.9	2.16	1.64	3.65
Control	10	12.9	4.72		

df = 18                      table value at 0.05=2.101

The higher mean value by the investigational group, portrays that the tutees performed well in the academic ability in reference to knowledge level. Considering the standard deviation value, less variation has been showed by the tutees in comparison to the low performers of the opposite group. The higher t-value (calculated) supports to the rejection of null hypothesis.

**Table 5***Effect of peer tutoring with regard to tutees' comprehension level of cognitive domain*

Groups	N	Mean	SD	SE <sub>D</sub>	t-value
Investigational	10	9.2	0.9	0.62	3.5
Control	10	7	1.76		

df = 18                      table value at 0.05=2.101

The higher mean value on the part of the investigational group, gives us an indication of the better academic performance by the tutees in reference to the comprehension level. Likewise, the value of standard deviation showed less variation with respect to the group of tutees contrary to low achievers of control group. The higher calculated t-value supports the rejection of null hypothesis.

**Table 6***Effect of peer tutoring with respect to tutees' application level of cognitive domain*

Groups	N	Mean	SD	SE <sub>D</sub>	t-value
Experimental	10	4.7	2.1	0.9	2.06
Control	10	2.8	1.98		

df = 18                      table value at 0.05=2.101

The higher mean value (4.7) of tutees of the investigational group in contrast to and the mean value of low achievers of the opposite group which was 2.8, showed less difference in the academic performance in connection to the application level. The value of standard deviation indicates that the control group showed less variation as compared to experimental group. The low t-value (calculated) supported the null hypothesis.

### Discussion

Two equivalent groups were formed on the basis of pre-test scores and application of pair random sampling technique. Each of these group was further divided into high and low achievers accordingly on the basis of median results. The application of t-test led us conclude that the difference between high achievers (tutors) of experimental as well as of the control group was insignificant, at the 0.05 level of significance. Similarly, the differences between tutees of investigational and low achievers of control group were also found insignificant. The members of the



investigational group were exposed to peer tutoring while that of the control group were taught through the method of lecture demonstration. The treatment was continued for seven weeks. Post-test was conducted soon after completion of treatment from both groups. Post-tests data and its values were obtained through t-test at the level of significance (0.05).

H<sub>0</sub> 1: The t-value 2.56 > 2.101 (table value), in table No.1 revealed that there was a significant variation between high achievers and tutors with regards to knowledge level of cognitive domain after treatment; hence, the null hypothesis was rejected. These findings may be matched with Mehra and Mondal (2005). Similarly in case of tutees and low achievers in table No.4 the null hypothesis may be rejected as a result of t-value 3.65 > 2.101 (table value), which shows that the variation between tutees and low achievers in the academic attainment with respect to "*knowledge*" level of cognitive domain was significant after treatment. The same findings were also exhibited by Mehra and Mondal (2005).

H<sub>0</sub> 2: The hypothesis which claims negation was accepted on the basis of inferential statistics (0.75 < 2.101) as shown in table No.2. This result shows that the difference between tutors and high achievers in the academic achievement with respect to "*comprehension*" level after treatment was not significant. While in case of tutees and low achievers, the null hypothesis was rejected as table 5 shows t-value 3.5 > 2.101 (table value). This leads to the difference between tutees and low achievers after treatment was significant with regard to "*comprehension*" level of cognitive domain. Mehra and Mondal (2005) was also in favour of this findings.

H<sub>0</sub> 3: The t-value 2.42 > 2.101 (table value) as shown in table No.3 is significant enough to reject the null hypothesis. This consequence leads to the statement that the difference between tutors and high achievers after treatment was significant with regards to "*application*" level of cognitive domain. Contrary, the hypothesis which claims negation, was accepted on the basis of inferential statistics (2.06 < 2.101) shown in table No.6. Hence it is revealed that there is difference between the academic performance of the low achievers and tutees with respect to "*application*" level after treatment was not significant.

## Conclusions

The findings of the study resulted in the following conclusions;

1. The tutors of investigational group and the good performers of control group were determined equivalent as no substantial difference was noted in their pre-test- scores of achievements.
2. Similarly, the results of t-statistics of pre-test scores lead us to the inferences that low performers of both groups declared equivalent as no significant differences were noted.
3. A significant high elevation was noted in academic scores of the tutors of the experimental group after treatment in post-test with respect to the knowledge level and application level of the cognitive domain as compare to high achievers of the control; thus, the significant role played by peer tutoring in enhancing the knowledge as well as the application ability of the students was determined.
4. No clear elevation was noted between tutors of the investigational group and high achievers of the control group in the level of comprehension. Thus, it may be concluded that treatment sessions of tutoring among peers did not have a significant effect on the development of comprehension ability of the tutors.

5. Likewise, a significant promotion was noted in academic performance of tutees after sessions of peer tutoring in the post-test scores in the level of knowledge and comprehension of cognitive domain as compare to less achievers of the control group; thus, the significant role played by peer tutoring in enhancing the academic performance of tutees with regards to knowledge and comprehension levels showed improvement. However, there was no significant elevation shown between the low achievers of the control group and those of the experimental group that led to the conclusion that there was no considerable role of peer tutoring in promoting the application competence of the peer tutees.

### Recommendations

The following recommendations are enlisted on the basis of conclusions:

1. The findings revealed that peer tutoring promotes academic performance; hence, it is suggested that it may be incorporated in the process of the learning experiences of students so that their academic efficiency is enhanced.
2. It is further recommended that during classroom instruction, students of low academic performance may be paired with students of good performance for long sessions so that the formers are guided and tutored properly.
3. The effect of peer tutoring was not found significantly effective in the development of comprehension level of the tutors and application level of the tutees; therefore, the future researchers may focus on this area for an in-depth re-investigation.
4. The study investigated the academic efficiencies of tutors and tutees only; further such study may be conducted focusing the impact of peer tutoring on motivation, vocabulary enhancement and social efficiencies of the students.
5. Similarly, the current study focused only male participants; hence, additional studies are recommended for exploring the influence of peer tutoring targeting female and population of diverse levels.

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