

## Effect of Cooperative Learning on University Research Scholars: Achievements in learning Statistical Software

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### Abstract

The present study aimed to find out the effect of cooperative learning on M.Phil students' achievement in learning SPSS software. In this research pre-test post-test control group only design was used. Sixty students of M.Phil (Education), who were enrolled in a public university, were divided into experimental and control groups by using matched-pair technique. A teacher made test was conducted as pre-test and post-test for both groups. No significant difference was found in pre-test scores of experimental and control groups. The experimental group was treated by STAD (Student Team Achievement Division) method of cooperative learning while control group was taught by traditional learning under the control condition for a period for eight weeks. Analysis of the data revealed the performance of experimental group was significantly better than that of control group. Hence, it was concluded that cooperative learning was better instructional strategy for increasing the student achievement in learning SPSS. By viewing the information obtained by this study, the teachers of quantitative methods may be in a position to improve their teaching methodology. Keeping in view the results of the study, curriculum designers and policy makers may be able to incorporate cooperative learning as the methodological aspect of the curriculum at higher education level. On the whole the study will be useful for teachers, trainers, educationists, curriculum developers, and educational administrators.

**Keywords:** cooperative learning, student team achievement division (STAD), achievement, SPSS

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## Introduction

Education is the central pillar of the entire systems of a country. Nobody can negate the vibrant role of education in nation building. In the era of globalization it has become the necessity of time to teach the digital learners of 21<sup>st</sup> century with more innovative styles and strategies to develop a skilled and competent nation. Consequently, there is a need for appropriate methods and strategies to provide the quality of education. Especially in Pakistan, there is a major decline of appropriate methods of teaching quantitative techniques as it is seen often in public universities which adopt traditional learning methods. Traditional strategy is not enough in this modern era of education system. Researchers (Khan, 2008; Yang, 2013; Adyeme, 2008; Tanel & Erol, 2008) had found that cooperative learning was better than traditional learning. Cooperative learning has been proven a better instructional strategy for the teaching of social sciences and research methods and it is being used all over the world due to social interaction involved in it (Kagan, 1994). John Dewey was considered as a key figure in the early 19<sup>th</sup> century who emphasized on learning by doing. Deutsch (1949) had examined that the results of cooperation in small groups are better than competition due to multifaceted outcomes (John & Johnson, 1999).

In cooperative learning strategy, students work actively and decisively in small groups to improve their learning skills (Johnson & Johnson, 1999). Several researchers such as Khan (2008), Atashian and Zamini (2013), Aziz (2010) and Gaith (2003) found that cooperative learning outperformed traditional method and it enhances the cognitive skills (Bukunola and Idowu, 2012; Flynn, 2013; Sharan & Sharan, 1992; Simsek, 2009; Vaughan, 2000; Wola, 2008). Cooperative learning is a settlement that works closely with different groups of students which receive a reward based on the success of the entire group (Woolfolk, 2001). So, cooperative learning is a student centered strategy in which the role of a teacher is to provide facilitation as compared to traditional teaching. Research findings revealed that cooperative learning approach has increased student satisfaction with their learning process. It promotes student self-confidence in promoting social skills and promoting positive relationships (Kagan, 1994).

Learning quantitative techniques is of vital importance in the fields of research, such techniques are beneficial in conducting research effectively and presenting the results of the research in a professional manner. It is equally important to understand the process of how we can improve quantitative research methods learning abilities among our students whose research achievements are mostly associated with the learning of quantitative research methods. Adams and Hamm (1990) stated that in Pakistan traditional method of teaching research tools

which is the most common and the least effective teaching method is used. This method is not enough for learning research techniques as it requires social interaction, while traditional learning involves no or less social interaction. Johnson and Johnson (1999) divided cooperative learning into four elements. Positive interdependence means that all the members of the group are bounded and dependent on each other and success of group is considered the success of the individual as they strongly believe on “sink or swim together” policy. Individual accountability means that every individual in the group is valuable and has the equal importance among the group as the other group members. Slavin (1995) concluded that in cooperative learning failure or success of the group and member are attached. So inter-dependence enhances achievement. While having Face-to-face Interaction, students share and discuss problems in such a way that every individual exchanges his or her research matters, in a group so that every person of the group could easily perceive, hear and practice the learning tools. Interpersonal skills, also called social skills, include communication, listening, delegation of tasks, decision power and leaderships that promote the effective communication and interaction among the students. The interaction among the group members helps the slow learners to grasp the topic of discussion and understand the new knowledge easily.

Slavin (1995) developed the student achievement division method which is consisted of formation of the groups, containing 4-5 students each with different performance level, teacher presents the material and delivers the sheets relative to the content, teacher allows the students to discuss and to share their ideas cooperatively in the groups, individual quizzes, and sum up the individual quiz scores and winner team is appreciated at the end. In STAD method every member contributes to his group and it is being used as heterogenous approach now a day. Slavin (1995) clarified that STAD method is useful to enhance the motivation among the students as positive interdependence lies in this approach and this method is deeply rooted in cognitive perspective, motivational perspective and cognitive elaboration perspective. Motivational perspective stresses on the goal or reward for students' work (Slavin, 1996). Cognitive elaboration perspective puts stress on clarification and explanation of the material to another person. Slavin (1991) identified that students illustrated the elaborated strategies to each other and in this way they mastered the complex cognitive process. A large number of studies have been performed to find out the effects of cooperative learning in different subjects and at different levels. Iqbal (2004) studied STAD method of cooperative learning in school mathematics and enhances cognitive abilities. Khan (2012) explored students' academic achievements and self esteem in secondary school

science subject through cooperative learning. Many researchers (Atashian & Zamini, 2013; Khan, 2008; Jalilifar, 2010 & Ghorbani, 2012) found that cooperative learning (CL) outperformed traditional methods in classrooms. Cooperative learning in this regard can help to meet the desired goal. A few researches were also found which opposed the cooperative learning such as Parveen, Mahmood and Mahmood (2011) found that cooperative learning was not effective in social studies subject.

As literature review gave mixed points of view about the effectiveness of cooperative learning, researchers themselves tried to explore its effectiveness in Pakistani background. Learning quantitative research techniques for social science studies is considered quite important in Pakistan as it is believed to be the base for research oriented degrees and hence helps to perform better in data collection, research methods, data analysis, results and other aspects of research methods. So, this study was an effort to find out the effect of cooperative learning on university(MPhil) level students' achievement in the learning quantitative techniques by using SPSS software.

### **Objectives of the Study**

The objectives of the study were

- i. To find out the students' achievement in learning SPSS software with traditional learning strategy.
- ii. To investigate the students' achievement in learning SPSS software with cooperative learning.
- iii. To compare the students' achievement in learning SPSS software with cooperative learning and traditional strategy.

### **Research Questions**

- i. Is there any significant difference between experimental and control groups in the pre-test scores?
- ii. Is there any significant difference between experimental and control groups in the post test scores?
- iii. Is there any significant difference between experimental and control groups in the pre-test and post test scores in *entering and modifying data in SPSS*?
- iv. Is there any significant difference between experimental and control groups in the pre-test and post test scores in *charting data in SPSS* .
- v. Is there any significant difference between experimental and control groups in the pre-test and post test scores in *transformation and recoding*?

- vi. Is there any significant difference between experimental and control groups in the pre-test and post-test scores in present *statistical procedure*.

## Methodology

An experimental study was conducted in learning quantitative techniques using SPSS software to find the effects of cooperative learning on MPhil level students' achievement in quantitative research methods. All the sixty (60), MPhil students in the subject of research methods enrolled in a public university in district Rawalpindi, Pakistan, were selected as a sample in this study. Matching pair technique on the basis of semester result was used to distribute students in equal sized experimental and control group having 30 students in each. In both groups students were selected by using matched pair technique on the basis of first semester results. In both groups students had the same abilities as both groups involved twelve high achievers, twelve low achievers, and six average students. Furthermore, six sub groups were created in experimental group having five students each. Each sub-group had two high achievers, one average and two low achievers. Pre-test post-test control group design was used in this experimental study.

Experimental group was given treatment through STAD method of cooperative learning. Control group received traditional method of teaching. STAD method was developed by Slavin (1994), in which 4 to 5 students work together on a group assignment. A heterogeneous group of students with varying ability is prepared in which students of mix ability (low, average, and high achievers) are included. The treatment involves three stages: Initially, teacher instructs the whole groups. Second, the teacher provides opportunity to the students to practice previously learned techniques extensively and discuss to the group. Lastly, individual are given quizzes. Each individual's quiz score is counted and added into all individuals' scores and represented as whole group score. Based on their group performance, teams are nominated as super, good, and excellent.

In this experimental research, the researchers used the same strategy mentioned above. Permission was taken from the HoD of the education department of the university for experiment in MPhil Class. One teacher having 5 years teaching experiences to university students, with PhD in research methods were randomly assigned to each group. The researcher discussed with the teacher of experimental group about how to successfully implement cooperative learning method while teaching. On the first day in experimental group lecture was delivered on the given content. On second day, practical work about the previous

lesson and material were assigned to each cooperative group and asked to solve together in the sub groups. After receiving the practical work on laptops in SPSS software, students worked together in their groups to master the material and teacher played the role as a facilitator and helped the students if they required. On the third day, each individual was asked to solve the quiz test without any help. Every individual's quiz test was marked and summed up as a whole team score. In the end winning team was appreciated. Control group received instructions by traditional learning method (lecture method). In both groups same content in equal pace was taught but in control group, no sub groups were made and it was taught under the control conditions.

Same content on same day was taught in both groups. Both groups were taught separately and carefully so that nobody could mix in the other group. Moreover, softcopies of practical work done on the SPSS software were collected after the period. Pretest was administered prior to treatment whereas post-test was conducted at the end of the treatment. Various threats to internal validity were controlled during the experiment. For example, History was controlled by randomization of experimental occasions i.e. balancing in terms of experimenter, time of day, week, etc. Both the groups were taught by the same teacher for eight weeks. Classes were scheduled on Monday to Friday (daily for 35 minutes). Equal number of students was assigned to each group to control maturation and testing threats. No student was dropped out of the study and thus mortality threat was controlled. To collect the data, teacher made test was used. The test included items on all the four steps of learning SPSS i.e. entering and modifying data, charting your data, transformation and recoding and statistical procedures. The test included multiple choice question (MCQs) items. Same test was used for pre-test and post-test. The items included simple research based items so that students can understand easily. The data were analyzed by using t-test through (SPSS-16).

### **Analysis and Findings**

To analyze the data t-test (paired sample t-test and independent sample t-test) was used through SPSS version 16.

Table 1

*Pre Experiment Difference between Groups*

Group	N	Mean	SD	<i>t</i>	<i>p</i>	Effect size
Experimental	35	19.13	7.50	0.07	0.94	0.017
Control	35	19.00	7.18			

Table 1 indicates that in pre-test; student performance in experimental and control group was same, meaning both groups did not significantly differ before the treatment.

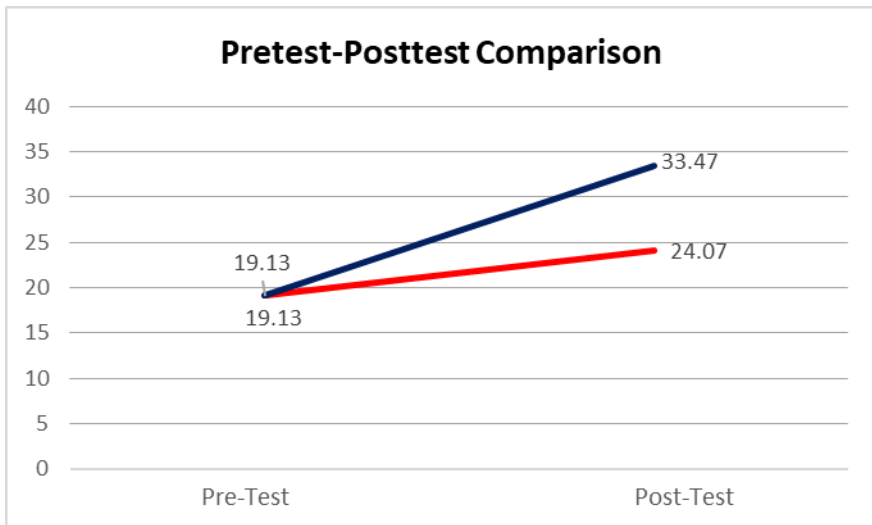
Table 2

*Post Experiment Difference between Groups*

Group	N	Mean	SD	<i>t</i>	<i>p</i>	Effect size
Experimental	35	33.47	10.007	4.164	0.001	1.088
Control	35	24.07	7.270			

Table 2 indicates that experimental group significantly performed better than control group with effect size =1.088. The results of pre-test and post-test tests can be viewed in figure 1.

Figure 1: Pretest posttest Results Comparison



According to Figure 1, both groups demonstrated similar achievement score and did not significantly differ on pretest; however, both groups performed better in posttest but it is obvious that experimental group significantly better performed as compared to control group.

Table 3

*Pre-test Post-test Difference between Control Group*

Group	Mean	SD	t	P	Effect Size
Entering and Modifying Data Pre-test	5.07	2.050			
Entering and Modifying Post-test	6.93	2.333			
Entering and Modifying Post-test	5.50	1.943	-5.696	0.001	0.849
Charting your data Pre-test	6.13	2.224			
Charting your data Post-test	4.27	2.227	-1.878	0.070	3.307
Transformation and recoding Pre-test	5.93	2.651			
Transformation and recoding Post-test	4.07	2.212	-3.379	0.001	0.681
Transformation and recoding Post-test	5.03	2.251	-2.473	0.200	0.43
Statistical Procedure Pre-test					
Statistical Procedure Post-test					

Table 3 indicates differences in student achievement on pre-test and post-test in control group. Control group students, taught by traditional learning had higher scores in post-test than pre-test. It can be concluded that increase in students’ achievement in post-test was only due to the continuous teaching as extraneous variables were controlled in the group.

Figure 2: Pretest posttest Differences between Control Group



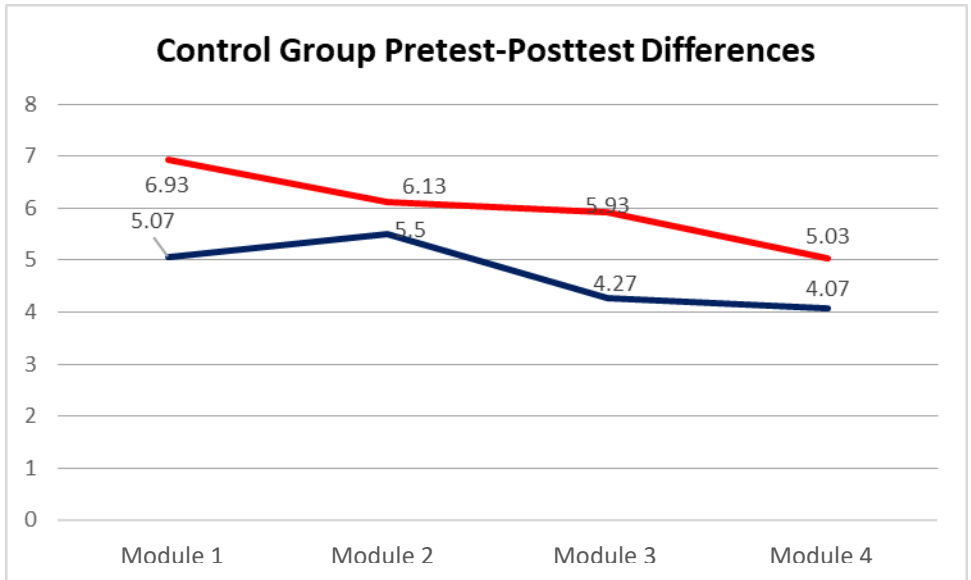


Figure 2 shows Pre-test Post-test differences in Control group performance and we can see that highest difference was seen in Entering and modifying data and smallest difference was found in charting data.

Table 4

*Pretest Posttest Difference between Experimental Groups*

Group	Mean	SD	<i>t</i>	<i>P</i>	Effect Size
Entering and Modifying data Pre-test	5.40	2.312			
Entering and Modifying data Post-test	8.37	2.328	-7.228	0.001	1.28
Charting your data Pre-test	4.83	2.135			
Charting your data Post-test	8.60	3.169	-8.588	0.001	1.422
Transformation & Recoding Pre-test	4.23	2.402			
Transformation & Recoding Post-test	8.03	2.606	-9.379	0.001	1.58

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Post-test

Statistical Procedures Pre-test

Statistical Procedures Post-test

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Table 4 indicates significant differences in experimental group's scores on pre-test and post-test for all units of course.

Figure 3: Pretest Posttest Differences between Experimental Group

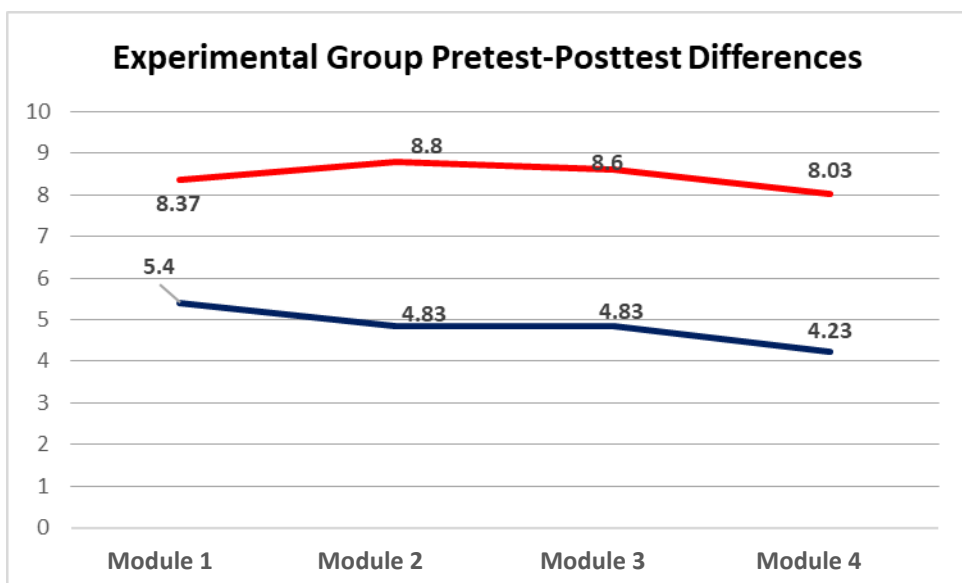


Figure 3 shows differences in performance of experimental group in pre-test and post-test. We can see that highest difference is found on charting data while lowest difference is in entering and modifying data.

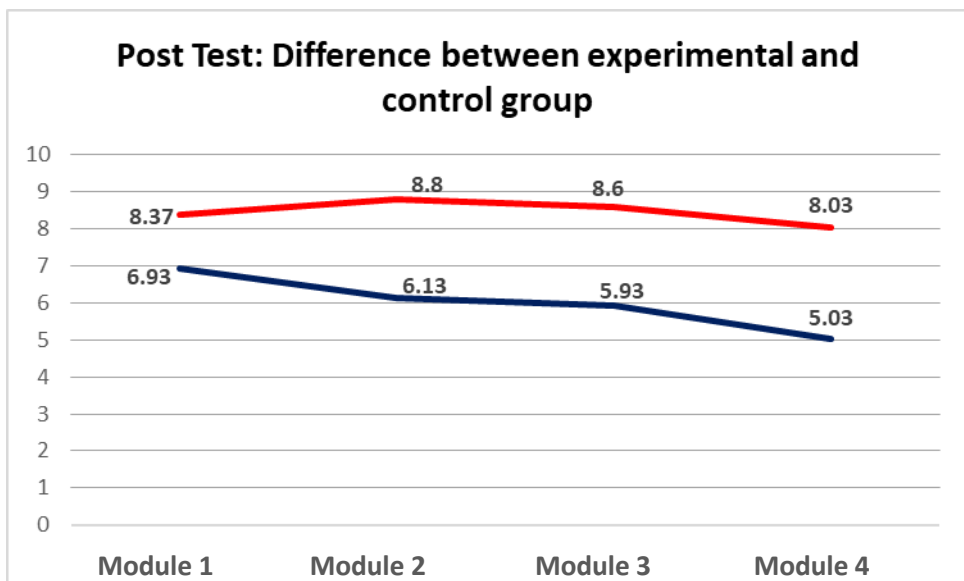
Table 5

*Post Group Difference between Experimental and Control Group (N=35)*

Group	Mean	SD	t	p	Effect Size
Entering and Modifying data Experimental Group	8.37	2.312			
Entering and Modifying data Control Group	6.93	2.050			
Entering and Modifying data Experimental Group	8.80	2.858			
Entering and Modifying data Control Group	6.13	2.224	2.541	0.014	0.660
Charting your data Experimental Group	8.60	3.169			
Charting your data Control Group	5.93	2.651	4.034	0.001	1.050
Transformation & Recoding Experimental Group	8.03	2.606			
Transformation & Recoding Control Group	5.03	2.251	3.535	0.001	0.917
Statistical Procedures Experimental Group					
Statistical Procedures Control Group			4.771	0.001	1.23

Table 5 indicates significant differences in performance of experimental and control group on all modules of course. Highest differences were found in charting data and statistical procedures.

*Figure 4: Post test difference between experimental and control group*



In post-test group results of experimental group for all the course module scores were significantly higher than control group. As experimental group was treated with cooperative learning; so, students' achievement in all course module can be attributed to cooperative learning.

### Conclusion and Discussion

The findings of this study were divided into five steps; i) pre-test results, ii) post-test results, iii) control group results, iv) experimental group results and v) post-test results in each module of course. Pre-test results were same for experimental and control group but in post-test results experimental group students' achievement was significantly higher than control group. It was concluded that in cooperative learning method students outperformed than traditional learning method.

During the extensive review of literature it was found that cooperative learning was being practiced in western countries as compared to Pakistan a third world country. Hence, a very few research studies was found in the local context regarding learning of Research methods. So all these critical and hurdles in quantitative research methods provoked the

researcher to test and experiment this new instructional approach in class room. This research study may be helpful to overcome the problems occur in learning quantitative techniques and SPSS software and further more cooperative learning may take place in Pakistan's curriculum as instructional approach. Thus a study was designed to investigate the effects of cooperative learning on students' achievement in learning SPSS software for quantitative research methods. Several other research studies have found that same results such as Atashian and Zamini (2013), Khan (2008), and Kosar (2003). Moreover the results of this study were strengthened by many other studies which have investigated the effects of cooperative learning on quantitative research methods learning (Jalilifar, 2010; Rahvard, 2010; &Ghorbani, 2012).

A few researches were also found which opposed the cooperative learning such as Parveen, Mahmood and Mahmood (2011) found that cooperative learning was not effective in social studies subject for 8th graders. For rational of cooperative learning as powerful tool in academic field can proved satisfactory through given researches on different area of subjects. In arts subject following researchers conducting positive results in the favour of cooperative learning: Arbab (2003), Kosar (2003), Satti (2012), Coppola (2007), Pandya, (2011), Acosta and Marcela (2012), Kadir, (2005), Servetti, (2009) and Sheiki (2012). In the subject of research following researchers like Jalilifar (2010), Norman, (2005), Bibi (2002), Ghina (2008), Khan, (2011) and Ghorbani (2012) found positive results of the cooperative learning on students' achievement.

In the subject of science following researchers conducting positive results in the favour of cooperative learning: Okebukula and Ogunmigi (1984), Simsek, (2009), Shachar and Ficher (2004), Conwell (1988), Lazarowitz and Herts (1994), Chang and Brickman (2006), B-AJB (2012), Patrick Ajaja (2010), Armstrong, Change and Brick man (2007), Hanze (2007) and Masood (2012). In the subject of mathematics following researchers conducting positive results in the favour of cooperative learning: Whocker, Bol and Nunnery (1997), Jodie Maxe (2012), Chung Chin and Daud (2010), Van Dat Tran (2012), Vanghan (2000) and Kola Wola (2008). In the subject of research following researchers found positive results in the favour of cooperative learning; Jalilifar (2010), Norman, (2005), Bibi (2002), Ghina (2008), Khan, (2011) and Ghorbani (2012). Above all researches provide the rationale for cooperative learning. Learning quantitative methods of research through STAD method of cooperative learning, proved very effective according to analysis of the data in present study. In control group students' achievement in all exercises of "entering and modifying data" proved better in post-test than the pre-test and it was concluded that it was due to the continuous teaching in control group because in control group

students' achievement was not found higher than experimental group. Overall results and findings showed that cooperative learning improves students' learning in SPSS software than traditional learning.

### Recommendations

- Cooperative learning is an effective instructional strategy for academic achievement particularly for quantitative techniques and SPSS software. So for the implications of this study more researches should be conducted in other provinces with a diversity of population.
- Quantitative research methods trainers and teachers should be trained and motivated to use cooperative learning as an instructional strategy because technique learning need proper environment for socially interaction.
- Effect of cooperative learning should also be studied with other variables like self-regulation, self-esteem and self-efficacy other than achievement.
- Cooperative learning may also be used in local context for the teaching of other subjects like science and math etc.

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