

Impact of Teacher's Training on Interest and Academic Achievements of Students by Multiple Teaching Methods

Muhammad Hafeez ^{1*}

¹ Research Scholar, Allama Iqbal Open University, Islamabad, PAKISTAN

*Corresponding Author: mh9589041@gmail.com

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ABSTRACT

The aim of this research was to check the effects of teacher's training and teaching methods on academic achievements and interests of students at secondary schools in computer course. The population was divided into four groups; - lecture teaching method (control group), discussion teaching method (experimental method), inquiry teaching method (experimental group) and demonstration teaching method (experimental group). Each group has a sample size of 20 students. A pre-test before training of teachers and post-test after training of teachers for academic achievement and interests of students taught by four teaching methods were conducted. The results of pre and post-tests were then analysed by statistical tools of descriptive statistics and ANOVA test. The results of the study indicated that students' academic achievements and interests were increased before and after the training of the teachers taught by lecture, discussion, inquiry and demonstration teaching methods. The demonstration teaching method was ranked 1st and lecture teaching method was ranked last. So, it can be concluded that training of the teacher's plays an important role for choosing the best method for teaching and improves the academic achievements and interests of students.

Keywords: instructor, learning styles, school, teaching methods, thinking skills

INTRODUCTION

A training is a process to get the required skills for a particular subject. The training is a valuable practice for the teachers to enhance their teaching skills. A trained teacher has more skills and techniques to be applied for the better academic achievements of learners (Ulla, 2018). A teacher having better teaching skills can also produce students' interest in a particular subject (Giovazolias et al., 2019). Many researchers including (Oliveira et al., 2019; Supriatna, 2015; Ulla, 2017) stated the importance of teachers training. The teacher's training provides the solutions of educational problems (Schütze et al., 2017).

In this modern age, the teacher's training is an important requirement and essential component for all the educational activities including conducive learning environment, curriculum development and implementation and assessment (Zulfiqar, 2016). A trained and skilful teacher has more ability to teach the students and implement the various teaching methods successfully (Saira et al., 2021). When teachers apply the various teaching methods and techniques according to the acquired skills then students achieved higher academic results and the interest of the student is also increased (Wuryaningsih et al., 2019).

Education is necessary element of humanity and crucial for the development of a nation (Hafeez et al., 2020). To educate most of the population in a country, it is necessary to impart free education up to the secondary level. In Pakistan, education is almost free up to secondary level (Ahmad, 2014). The secondary education is the education given to children of aged 13-16 years (Ahmed, 2016). The primary aims of secondary education are to train students for the sound abilities in reflective, scientific and critical thinking (van & Janssen, 2019). Teaching is the learning process in which knowledge and information's are transferred to the children to understand the scientific process (Sivarajah et al 2019). A teacher is the facilitator to provide the guidance in the teaching-learning process (Obidike, 2017).

The teaching method represents the different strategies by which an instructor delivers lecture to the pupils based on predefined instructional objectives (Buseri & Dorgu, 2011). Omar et al. (2020) stated that the main objectives of teaching are to support learners for getting, retain and utilization of information, establishment of habits and development of attitudes and increased store of information and understanding of basic rules and principles of subject matter.

To achieve the cognitive domain of learning of the learners, the psychologists developed various teaching methods and strategies according to the cognitive domain of learners and learning situations (Mahasneh, 2020). Teaching and learning methods

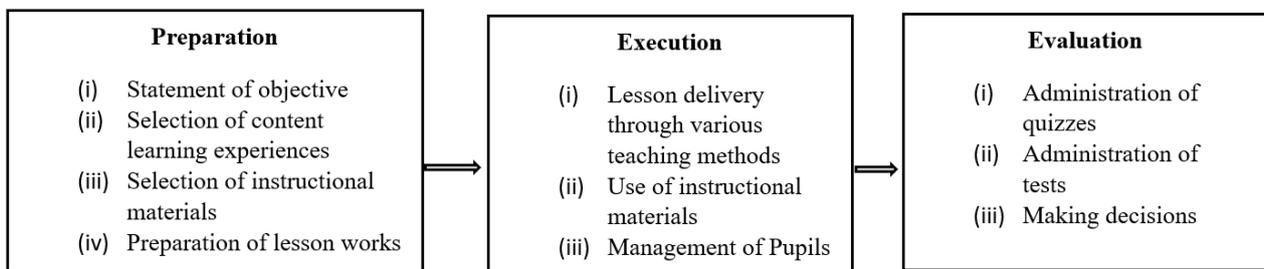


Figure 1. Basic components of effective teaching



Figure 2. Training components for professional development of teachers

are key factors for the development of different educational fields (Al-Otaibi, 2015). The Training components for professional development of Teachers are shown in **Figure 1**.

The methods of teaching that stimulate active learning are based on the cognitive domain of learning (Saira et al., 2021). The learners must actively engage with the learner's activities. The active learning activities are also called as student-centre activities or student-centre teaching. Some of the teaching methods that promote active learning are discussion method, inquiry method and demonstration method (Asmawati & Malkan, 2020).

LITERATURE REVIEW

Teaching Methods

The various teaching methods are listed below:

Lecture teaching method

A lecture teaching method is stated as the instructor continuously speaks before a group of students on a particular subject or topic (Hafeez et al., 2021). The group size may vary from 20 to 1000. The instructor is responsible for delivering whole of the content of subject matter. It is one of the oldest teaching methods used in schools, colleges and universities (Carson et al., 2001). The lecture method of teaching is based on the transfer of knowledge from instructor to the learners. The lecture method of teaching is also called traditional lecture or teaching method (White & Kern, 2018). Many instructors believe that traditional lecture method is not more successful in the cognitive development of learners as traditional lecture method is a passive method of learning. It does not involve the learners to contribute in the educational process. Usually, instructor presents the whole lecture before the learners. The learners get the notes of the lecture and prepare them for the examination (Jungst et al., 2003). The major reason for adopting the lecture method of teaching is its ability to handle with large number of learners at a time (Marmah, 2014). The important characteristics of lecture teaching method are highlighted in **Figure 3**.

In the current age, the lecture teaching method is considered as the bored method because it does not active the students. However, it can be made effective by blending the information technology tools (Fulford & Mahon, 2018). Gooblar (2019) argued that telling (lecture method of teaching) is an excellent method for the learners as in lecture method the instructor delivers all the contents with details.

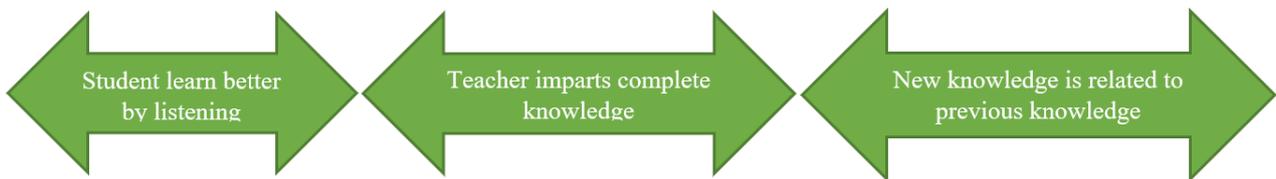


Figure 3. Characteristics of Lecture Method of Teaching



Figure 4. Characteristics of discussion teaching method



Figure 5. Characteristics of demonstration teaching method

Discussion teaching method

The discussion teaching method is a strategy which is used by groups for cooperative learning to get the desired educational objectives (Omoro & Nato, 2014). The discussion is an activity in which the instructor divides the class and makes small groups of learners for active and cooperative learning on a specific topic or real-life problem. It is the process in which the learners are free to talk with each other's and also with the instructor. The discussion teaching method is a learner-centred method in which the learners contribute their ideas actively (Yusuf, 2016). Rahman et al. (2011) proposed in a study that discussion teaching method is the most valuable and applied teaching method all over the world in various fields of education. They also concluded that discussion teaching method improves the critical thinking skills, cognitive learning abilities, attitudes and speaking skills. The main characteristics of discussion teaching method are highlighted in **Figure 4**.

Among available teaching methods, the discussion method appears to be the effective and most advanced teaching method. The discussion method of teaching is a type of strategy in which instructors and learners share their thoughts and ideas on a particular course content. The learning objectives are achieved by utilizing shared ideas among students and teachers (Eggen & Kauchak, 2012). Paul et al. (2019) concluded in a study that discussion teaching method gives opportunity to the learners to interact with the instructor without any hesitation for clearly understanding the learning activities. The learners use their voices and listen other students respectfully and carefully to increase their learning abilities. It is an effective strategy to be used during the lecture.

Role of instructor in discussion teaching method: Leading the learners in constructive discussions in complex issues is a very difficult question in teaching (Sivarajah et al., 2019). The role of instructor is very important in discussion teaching method. An instructor must be good leader to lead the discussion and learners in the classroom. The learners may ask questions or comments during the discussion. A good leader has the ability to answer for all the questions raised by the learners. For all these challenges, the instructor must have a proper plan before the discussion session (Su et al., 2016). The instructor must be prepared for the bad comments in the discussion method (Abdulbaki et al., 2018). In discussion teaching method, the instructor may use different tools to conduct the discussion session. The tools may be projector, computer laptop for presentation and learning materials (Amalia, 2017).

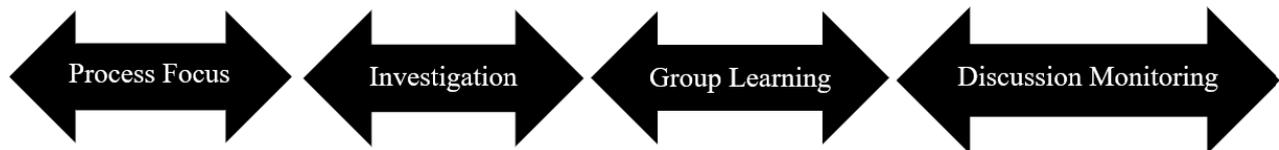
Demonstration teaching method

In demonstration teaching method, the instructor acts as a principal and the learners watch the lecture with attention. It is also called as display or exhibition method of teaching. The demonstration teaching method includes the steps that how different things work (Ameh & Dantani, 2012). The researchers (Teodora-Mihaela & Laurentiu-Gabriel, 2014; Vrbik & Vrbik, 2017) concluded in their studies that demonstration teaching method is the most suitable teaching method to improve and train the students learning and motor skills. Some researchers (Basheer et al., 2017; Polizzotto & Tamari, 2015) also concluded that the demonstration teaching method has a positive effect on the learners and it also improves the cooperative learning level of the students. This teaching method is combined with other teaching methods to activate the learners and learning process.

Anwar and Zulkifli (2020) stated that the key objective of demonstration learning method is to exhibit and display the models and activities according to the learning materials through instructional media. In demonstration teaching method the instructor is the main character to display the activities. The main characteristics of demonstration teaching method are highlighted in **Figure 5**.

Table 1. Advantages and disadvantages of multiple teaching methods

Teaching Method	Advantages	Disadvantages
Lecture	<ul style="list-style-type: none"> • Widely used and accepted • Facts and figures are told before the in a logical manner • Useful for introducing new concepts • Used to deliver the new learning materials not yet accessible in the form of books or print • Effective to transfer knowledge to a large group • Useful for learners who learn and understand by listening 	<ul style="list-style-type: none"> • May not be useful to develop their cognitive and higher order thinking skills • Stress on the creativity and thinking skills of learners • Learners become passive • No assessment for learners • Information acquired forgotten quickly • Instructor learns more than the learners
Discussion	<ul style="list-style-type: none"> • Increases the interest for learning by discussing the topic of interest • Develop critical thinking skills by discussion on a particular topic • Gives an opportunity to all the learners to express their views and transfer the knowledge • Provides the platform for new thoughts and ideas 	<ul style="list-style-type: none"> • May go into another direction rather than the topic chosen for discussion • Time consuming process • Course outlines may not cover • Discussion session may be led by few and active participants and the remaining participants may be no advantage of discussion session
Inquiry	<ul style="list-style-type: none"> • Increases the critical thinking skills of the learners by thinking about the solution of problems • The learners take the ownership of learning process • Increases engagement of the learners 	<ul style="list-style-type: none"> • Does not work well for all the scientific topics • It requires more planning • More skills are required to implement the inquiry teaching method
Demonstration	<ul style="list-style-type: none"> • Helps to concentrate more efficiently towards learning • The learners understand the concept in a best way to solve the real-life problems • Improves the comprehension skills of the learners 	<ul style="list-style-type: none"> • Requires a proper place and equipment to perform the demonstration • It may prove costly. • May require some special skills that are not locally available

**Figure 6.** Characteristics of inquiry teaching method

There are number of studies found in the literature to show the effectiveness of demonstration teaching method on learner's academic achievement in various disciplines. Furo et al. (2014) conducted a quantitative study to examine the various teaching methods including lecture, discussion, demonstration and inquiry methods on the students of primary and secondary schools. The conclusion of the research showed that the demonstration teaching method was the most appropriate method for the learners of primary and secondary schools. This method increases the critical thinking skills and cognitive domains of the learners. The authors also concluded that the lecture teaching method was the least accurate method.

Inquiry teaching method

The inquiry teaching method is also called the discovery method. An inquiry is a procedure to understand the basic principles and concepts through the practice of observations, experiments and investigation (Shamsudin et al., 2013). The students learn by doing in the inquiry teaching method. The instructor guides the learners and also observes the activities of the students (Dorgu, 2016). The learners are engaged actively in the learning activities by following the scientific method to build their knowledge and to achieve their objectives (Dagnew & Mekonnen, 2020). The learners try to discover new knowledge by finding the answers of questions by minimum guidance of the instructor in inquiry teaching method (Farah & Ayoubi, 2020).

Sylvanus and Eke (2017) categorized inquiry method of teaching into three types. (i) Open Inquiry method (ii) Structured Inquiry method (iii) Guided Inquiry method. In Open inquiry method, the learners find the problem, method to solve the problem and synthesis results. In Structured Inquiry method, the instructor guides for identified problem and provide materials as well as procedure related to the problem. In Guided inquiry method, the instructor only provides the problem and materials related to the problem. The learners their-selves identify the procedure to solve the problem and compile the results. The main characteristic of Inquiry teaching method are highlighted in **Figure 6**.

Many researchers conducted researches to evaluate the inquiry teaching method. Suryanti et al. (2018) directed a research to investigate usefulness of inquiry teaching method on the critical thinking skills of a primary school learners. The results of the study showed that the inquiry teaching method is an effective way to increase the critical thinking skills of the learners. Sandika and Fitrihidayah (2018) led a research to examine the effect of inquiry learning method on scientific attitude and creative thinking of the learners in a secondary school. The study concluded that the inquiry teaching method enhanced the creative thinking and improved the attitudes of learners towards scientific knowledge. The main activities involved in inquiry teaching method are illustrated in **Figure 7**.

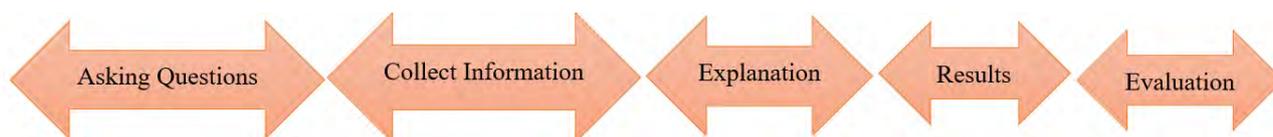


Figure 7. Activities involved in inquiry teaching method

Teacher's Training, Multiple Teaching Methods and Students' Academic Achievement

There is a close relation between the teacher's training, teaching methods and students' academic achievements. A trained teacher can apply multiple teaching methods and techniques in better way. Nzarirwehi et al. (2019) conducted a study to compare the academic achievements of students learnt from trained and untrained teachers. The outcomes of the research indicated that the pupils who learnt from the trained teachers got high academic achievements and the other students learnt from the untrained teachers got low academic achievements.

Behroz-Sarcheshmeh et al. (2017) investigated in a study that the trained teachers have better communication, teaching and critical thinking skills. They also concluded that students' academic achievement and interest improve when a trained teacher apply the teaching methods according to the classroom environment and situations.

Özüdogru (2020) conducted a research to check the responses to the questions raised by students from trained and untrained teachers. The conclusion of the study indicated that the teachers who have done trainings responded the students in a better way as compared to the untrained teachers.

PURPOSE OF THE STUDY

Many studies found in the literature in which accuracy of various teaching methods for the learners under various learning situation have been performed. But there has been no study found in which impacts of teacher's training on students academic achievements and interest by multiple teaching methods have been assessed for academic achievement and interest of secondary school students. So, the objectives of current study are to review the various teaching methods, to assess the impact of teacher's training on academic achievements and interests of students in computer course of secondary school students.

Hypothesis

- Ho 1:** No significance difference found between pre and post-test scores in academic achievements of pupils educated with four teaching methods in computer course.
- Ho 2:** No significance difference found between pre and post-test interest scores in computer course educated with four teaching methods.

METHODOLOGY

Sample Size

The research study followed the Quasi-experimental design and was done in Government Schools in Dera Ghazi Khan, Punjab Pakistan. A total of 300 learners for population were selected from twenty Government secondary schools for the research. As the number of schools were large, the multi stages sampling strategy was utilized to choose the sample for the research. By using the simple random sampling technique, a sample size of 100 learners were chosen from population. The sample size was divided into four groups namely; Control group (Lecture teaching method) 20 students, Experimental group I (Discussion teaching method) 20 students, Experimental group II (Demonstration teaching method) 20 students and Experimental group III (Inquiry teaching method) 20 students to assess the pre and post-test academic achievement scores and interest scores of pupils.

Instruments

The instruments used for collection of data were Computer Course Achievement Test (CCAT) and computer course Interest Scale (CCIS) which were authorized and validated by four experts from the Computer Science Department, Ghazi University, Dera Ghazi Khan. The comments and inputs from the experts enabled the researcher to produce final version of instruments. The reliability of instrument was constructed by using Cronbach alpha for CCAT and Kuder-Richardson-20 for CCIS. CCAT produced a value of 0.91 and CCIS produced a value of 0.87.

Data Collection

The control and experimental groups were assigned to four class teachers. A pre-test for academic achievement and interest about subject was taken after assigning the groups. The teachers were trained for one week about how to teach the groups. After four weeks teaching, post-test was taken for academic achievement and interest about subject matter of control and experimental groups of learners. The data was collected from the results of pre and post-test of control groups and experimental groups. The data obtained from pre-test and post-test results were then analysed by statistical tools.

Statistical Analysis

The results of pre and post-test were analysed by using various statistical tools and ANOVA test. The ANOVA was applied to test the hypothesis. After using the ANOVA, if p value obtained less than 0.05 ($p < 0.05$), then hypothesis will be accepted (Ho accepted) and if the p value obtained more than 0.05, then hypothesis will be rejected (Ho rejected).

RESULTS

Research Question 1: What are the impacts of Lecture, Discussion, Inquiry and Demonstration teaching methods on academic achievement of students in computer course.

Ho 1: No significance difference found between pre and post-test scores in academic achievement of students educated with four teaching methods in computer course.

The statistical outcomes are illustrated in **Table 2**. The outcomes indicate that mean academic achievement scores of students in pre- and post- test taught by lecture teaching method ranges from 7.31-7.49 with standard deviation ranges from 2.39-2.56. The mean pre and post-test scores for academic achievements taught by discussion teaching method ranged from 8.21-9.91 and standard deviation ranges from 1.89-1.86. The mean pre and post-test scores for academic achievements taught by inquiry teaching method ranged from 6.89-10.19 and standard deviation ranges from 2.78-2.92. The mean pre and post-test scores for academic achievements taught by demonstration teaching method ranged from 7.96-14.20 and standard deviation ranges from 2.48-2.67. According to the statistical results, the mean gain values for lecture teaching method were 0.32, 1.81 for discussion teaching method, 3.29 for inquiry teaching method and 6.19 for demonstration teaching method. According to the gain value it can be concluded that the demonstration teaching method was ranked first in academic achievements of students in computer course and lecture teaching method was ranked last.

Table 2. Statistical investigation of pre and post-test scores of academic achievements by multiple teaching methods

Method	N	Pre-test		Post-test		Mean Gain	Rank
		\bar{X}	SD	\bar{X}	SD		
Lecture (control)	20	7.31	2.39	7.49	2.56	0.32	4 th
Discussion (exp)	20	8.21	1.89	9.91	1.86	1.81	3 rd
Demonstration (exp)	20	7.96	2.48	14.20	2.67	6.19	1 st
Inquiry (exp)	20	6.89	2.78	10.19	2.92	3.29	2 nd

\bar{X} = Mean; SD= Standard Deviation; N= Sample size

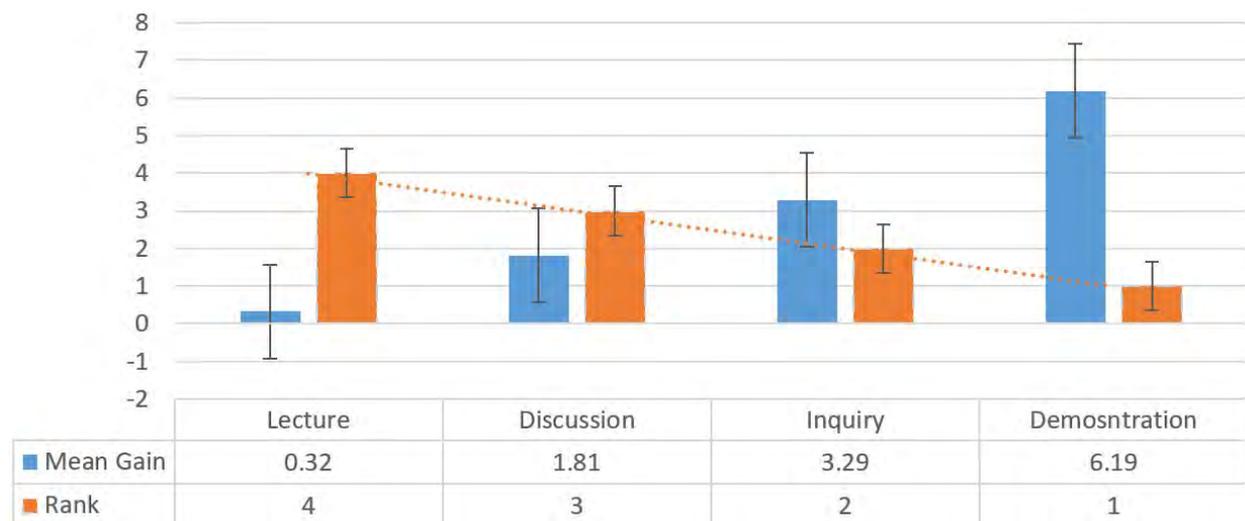


Figure 8. Mean gain and rank for academic achievements scores by using multiple teaching methods

The results of testing hypothesis that no significance difference found between the pre and post-test scores in academic achievement of students taught with four teaching methods in computer course are shown in **Table 3**. According to the statistical results, the F value was 0.718 and p value was 0.591. As the significance value is greater than the significance level of 0.05 so, the hypothesis that no significance difference found between pre and post-test scores in academic achievements of students taught with four teaching approaches in computer course is rejected.

Table 3. ANOVA for pre and post-test scores of students in academic achievements using multiple teaching methods

Source	Sum of Squares	Df	F	Sig
Between the groups	14.2	3		
Within the groups	26.374	4	0.718	0.591
Total	40.574	7		

Significance level=0.05

Research Question 2: What are the impacts of Lecture, Discussion, Inquiry and Demonstration teaching methods on interest of students in computer course.

Ho 2: No significance difference found between the pre and post-test scores in interest of students educated with four teaching methods in computer course.

The statistical results are illustrated in **Table 4**. The results indicate that mean interests scores of students in pre- and post-test taught by lecture teaching method ranges from 1.89-1.77 with standard deviation ranges from 0.78-0.82. The mean pre and post-test scores of interests taught by discussion teaching method ranged from 2.10-2.35 and standard deviation ranges from 0.89-0.91. The mean pre and post-test scores of interests taught by inquiry teaching method ranged from 2.05-2.31 and standard deviation ranges from 0.95-0.94. The mean pre and post-test scores of interests taught by demonstration teaching method ranged from 1.92-3.52 and standard deviation ranges from 0.64-0.83. According to the statistical results, the mean gain values for lecture teaching method were -0.13, 0.41 for discussion teaching method, 0.65 for inquiry teaching method and 1.49 for demonstration teaching method. According to the gain value it can be concluded that the demonstration teaching method was ranked first in interests of students in computer course and lecture teaching method was ranked last.

Table 4. Statistical investigation of pre and post-test scores of interests in computer course by multiple teaching methods

Method	N	Pre-test		Post-test		Mean Gain	Rank
		\bar{X}	SD	\bar{X}	SD		
Lecture (control)	20	1.89	0.78	1.77	0.82	-0.13	4 th
Discussion (exp)	20	2.10	0.89	2.35	0.91	0.41	2 nd
Demonstration (exp)	20	1.92	0.64	3.52	0.83	1.49	1 st
Inquiry (exp)	20	2.05	0.95	2.31	0.94	0.65	3 rd

\bar{X} = Mean; SD = Standard Deviation; N = Sample size

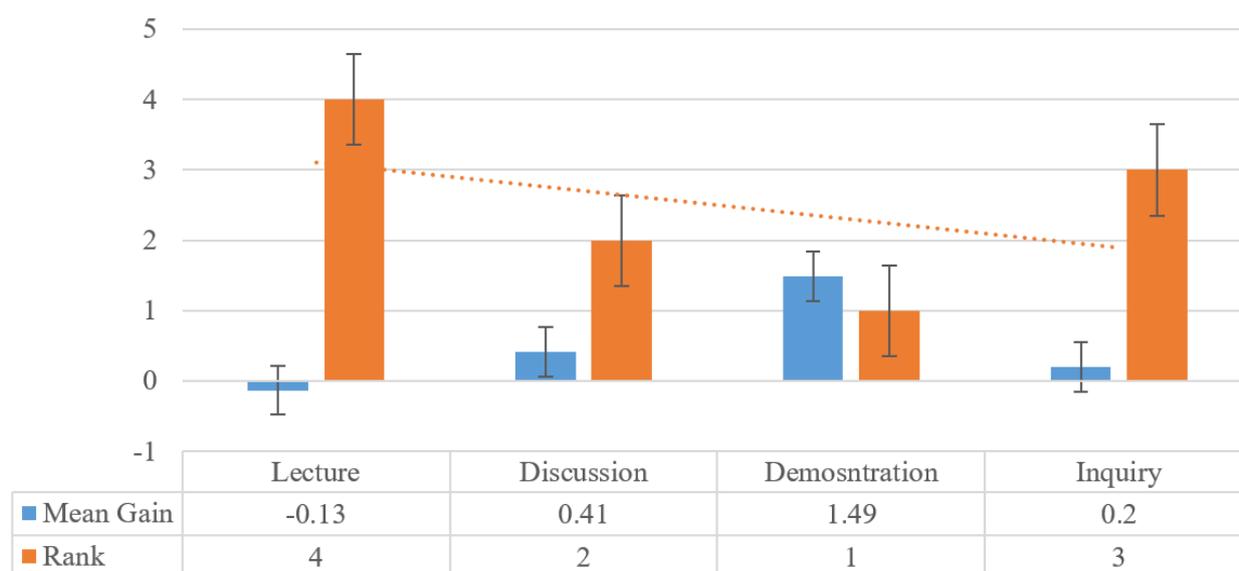


Figure 9. Graph between mean gain and rank for interests scores by using multiple teaching methods

The results of testing hypothesis that no significant difference have been found between the pre and post-test scores in interest of students in computer science taught with four teaching methods in computer course are shown in **Table 5**. According to the statistical results, the F value was 0.793 and significance value was 0.558. As the significance value is greater than the significance level of 0.05 so, the hypothesis that no significance difference has been found between the pre and post-test scores in interest of pupils taught with four teaching approaches in computer course is rejected.

Table 5. ANOVA for pre and post-test scores of students in interests using multiple teaching methods

Source	Sum of Squares	Df	F	Sig
Between the groups	0.804	3	0.793	0.558
Within the groups	1.352	4		
Total	2.157	7		

Significance value=0.05

DISCUSSION

Multiple teaching methods have been presented in the literature (Folounrunso & Sunday, 2017; Kiker et al., 2020; Sivarajah et al., 2019). Each teaching methods has its own requirements for implementation. A teaching method best at one place may be not fit for another place. To evaluate the impacts of teacher's training on students academic achievements and interest by multiple teaching methods a study has been conducted. The lecture, discussion, inquiry and demonstration teaching methods have been used to assess the academic achievements in a computer course of secondary school students for pre- and post- scores against

each teaching method. The student's interests in computer course for pre- and post- test scores are also assessed taught by four teaching methods. The scores of pre and post-test obtained by each teaching methods are statistically analysed.

The statistical results of impacts of lecture, discussion, inquiry and demonstration on students' academic achievement showed that there was a significant increment in the post-test scores of the students by each teaching methods after one-week training of the teachers. The lecture teaching method was ranked last and the demonstration teaching method was ranked first for students' academic achievement in computer course in secondary schools. A research conducted by (Anthony & Garner, 2016) resulted that the discussion, inquiry and demonstration teaching methods are better than the lecture teaching method where situations are favourable for applying these teaching methods.

The student's interest towards computer course taught by lecture, discussion, inquiry and teaching methods are also assessed. The results indicated that after the training of teachers, the scores were better than before the training. After training the teachers taught the students in a better way and increased the interest of students towards the computer course in computer course. The statistical analysis of pre and post-test scores of student's interests in computer course were better in post-test. The demonstration teaching method was ranked first and lecture teaching method was ranked last for increasing the interests of students towards computer course in secondary schools.

CONCLUSION

A research was conducted to statistically assess the academic achievements and interest of students in computer course taught by four (Lecture, discussion, inquiry and demonstration) teaching methods before and after the training of the teachers. A pre- and post- test is conducted to analyse the results. Pre-test is taken after assigning the control and experimental groups to each teacher. After the pre-test, one-week training is conducted for the teachers on how to teach the group by four teaching methods. After the training, post-test has been taken. The statistical results of the study showed that academic achievements and interest of students towards computer course were better after the training of teachers and demonstration method was ranked at first and lecture method was ranked at last.

RECOMMENDATIONS

- 1) The teachers must have trained to achieve the higher academic achievements.
- 2) There should be continuously refresher courses for teacher's training.

LIMITATIONS OF THE STUDY AND FUTURE RESEARCH

This research has been applied on the Government secondary school's students by selecting government school teachers on a small scale. The research can be done on a large scale for the province or for the whole country. The researcher can also be done on the primary school's students and teachers.

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