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Effect of Demonstration and Lecture Method on Academic Achievement of Secondary School Students in General Science: An Experimental Study

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ABSTRACT

The study was carried out to find out and compare the effect of demonstration and lecture method on academic achievement of secondary school students in subject of general science in Govt. Girls High School No.2 Rawalakot Poonch AJK. To achieve the objectives of the study, the researcher conducted an experimental research. For this purpose, two experimental groups and one control group were made by the researcher in the subject of 9th grade General Science students. Each group was consisted of 10 students. Post-test was taken to assess the achievement of the students of three groups. The experimental group 1 was taught by the researcher using demonstration method, and experimental group 2 was taught by lecture method, while the students of control group were taught by another teacher of equivalent qualification according to timetable prepared by the researcher. At the end of each lesson, a post test was taken. Total 10 post tests were taken to the students of each group and then they were assessed and marked by the researcher. Data was recorded and then one-way ANOVA test was applied to compare the Mean of each group. The findings of the study showed a significant difference between the three groups. The experimental group 1 showed better performance as compared to the experimental group 2 and experimental group 2 showed better performance as compared to the control group. It is concluded that demonstration method can be helpful for the learning of General Science at Secondary school. Demonstration method is recommended for the teaching learning process at secondary schools level.

Keywords: Demonstration method, Lecture Method, Secondary Schools, General Science

INTRODUCTION

Education is the most powerful tool for social and personal change that has a relatively formative effect on students. Through diverse teaching and learning methods, the basic goal of teaching at any level of education is to bring about a fundamental change in the students (Oigara, 2011). The efficiency of this teaching and learning process is primarily determined by the teacher's technique of instruction. The outcome of the teaching-learning process in the form of marks, grades, and mean scores reflects the success of a teaching method. (Whalen III,2012).

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Teacher-centered methods and learner-centered methods are the two types of teaching methodologies (Oigara, 2011). The lecture method, drilling, and questioning are examples of teacher-centered methods. Learning takes place in a teacher-centered method when teachers educate and then have students do exercises linked to the teacher's presentation during or after the lesson. This is to see if the students have absorbed the information that the teacher has imparted to them. It is thought that teachers should be knowledgeable with the language in which their students are learning. Language is essential to the process of teaching, as well as assessing or testing, in order to identify pupils' weaknesses or areas of confusion during the learning process (Brad, 2000).

Learner-centered education entails a situation in which students construct their own knowledge of the topic and form personal feelings about the things they've taught (Collins, 2003). This indicates that a student-centered method emphasizes inquiry and problem-based learning, putting students at the center of the learning process. Question and answer, group work, demonstration, guided learning, role play/drama, and project-based learning are some of the methods used in Learner-Centered methods.

The importance of a student-led learning strategy is that students have input into the content, activities, materials, and learning speed. The student-learning model emphasizes the student as a fundamental component of the school's teaching-learning process. The instructor provides platforms and opportunities for students to learn independently and from one another while also providing helpful supervision. The effectiveness of this teaching and learning procedure is largely determined by the teacher's method of instruction.

Learning science should be evidence-based. Demonstration allows kids to learn via observation and is appropriate when a school does not have enough money, resources, or time to conduct an investigation with all pupils. It can provide more opportunities for pupils to be engaged than instructor or textbook explanations alone. Demonstration planning is just as important as any other teaching method. It is also beneficial to conduct study before to perform demonstration in the classroom.

Students become considerably more interested and look forward to the lecture when a teacher enters the classroom with materials for presentation. Supporting their interests is critical, and you may do it by asking questions and using various methods to keep them focused. Managing the classroom during demonstrations is also vital to ensure that no student is left out of the learning process, including those in the back.

Demonstrations may make a big difference in how students learn. It is apparent that adding them to your teaching library is a good idea. The method of demonstration in teaching can be applied for teaching many subjects in different contexts. It is equally applicable for all genders and students of all ages from children to adults. Demonstration is practical display of ideas and methodologies which help students in directly observing the topics, students cannot understand the concepts by simple observations. The teacher plays most important role in aiding the students by appreciating them and giving them the demonstration of topic. Part of teacher is as a mediator and explainer (Monk and Osborne, 2000).Demonstrations can be dedicated to a variety of things. These can be divided into three categories:

• To inspire and excite students' curiosity prior to instruction

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• To clarify a phenomenon, concept, law, theory, or process
• To assist students in articulating and exploring their current ideas.

All of these are important, and a single demonstration can get you more than one of them. The goal will influence how you design and execute the demonstration. The Demonstration Method is a method of teaching that combines demonstration with explanation to illustrate a procedure or experiment. Demonstration is always achieved by handling or manipulating real items, exhibiting photographs, materials, or equipment to clarify a subject. Demonstrations are useful because they provide a physical representation of events and things. Students discuss terms and concepts related to the events they witnessed. If this method is utilized to conduct a study on students' science performance, it will be noted that students will be able to identify some of the challenges they faced in learning general science when given a problem to address. Using the demonstration technique, you can improve and clarify the topic you're teaching. Demonstration teaching is an effective way of instruction since it promotes student comprehension and retention (Ruebush, 2007).

The demonstration is useful in teaching science skills such as tool use and laboratory testing (AlRawi,2013). In a classroom situation, however, the amount of time available to perform this demonstration is severely limited. As a result, rather than using hands-on laboratory experiments, a demonstration is frequently prepared to allow students to make observations (McKee, 2007).

A lecture is a teaching activity in which the instructor provides content in a thorough manner by discussing facts, principles, and relationships, and during which the teacher is intended to stimulate student engagement using suitable strategies.

The lecture method is frequently utilized to convey a big amount of material to pupils in a short amount of time (Berry, 2008). The purpose of a lecture is to convey fresh information to a large number of students. When working with a large group, this strategy has been proven to be beneficial. (Weinberger and Gehlen-Bauum,2014), It might, however, be used for a small group. The following are the purposes of lecture method:

• To excite students' interest in a subject
• To introduce students to new areas of study
• To clarify complex concepts
• To assist in the preparation for a conversation
• To foster critical thinking

Students' poor performance has been attributed in part to insufficient teaching and instructional engagement is approved by teachers, who testified the seriousness of secondary school students' poor performance in General Science and identified the continued use of the traditional mode of instruction as one of the major shortfalls affecting learning and higher achievement. Subject teachers frequently use the lecture mode of instruction in order to cover the syllabus in the allotted time; however, this does not result in a thorough comprehension of the subject. In light of the former discussion, this research looked into the usage of two teaching methodologies: The purpose of this study was to compare the effects of demonstration and lecture methods on secondary school students' academic progress.

RESEARCH OBJECTIVES

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The objectives of the study are as under:

1. To find out the effect of demonstration method of teaching on Academic Achievement of secondary school students in General Science in Poonch
2. To find out the effect of lecture method of teaching on students' academic achievement in General Science at the secondary level in Poonch
3. To compare the effects of demonstration and lecture methods on students' academic achievement in General Science at the secondary level in Poonch

LITERATURE REVIEW

Demonstration method is applied by explaining the considered concept by performing the concept of real things, materials or showing objects by hand. As the demonstrations offer valid reference for the events so they are very valuable. Those concepts and terms are shared by the students who are detected by them. If the method of demonstration is utilized for taking performance of students in science subject in which students may find various difficulties and problems in learning and understanding science. Demonstration method is very effective way of teaching the lessons to the students.

According to McKee, Ruebush (2007) and Williamson, the method of demonstration to the students helps students in understanding and retention elegantly. The end investigation of lessons by students is modeled by the teacher in the method of demonstration (Daluba,2013). The demonstration of lesson by the instructor catches the attention of students most effectively. The method of demonstration is beneficial for teaching any kind of lesson and skill through the observation by learners. McKee (2007) writes that the method of demonstration in teaching is time taking, it cannot be completed in the available time slot so the students are given the short demonstrations that help them to detect the things instead of letting them perform by hands **(** Mckee, 2007).

Demonstration is a direct means of communicating with students (Iline, 2013).

The demonstration method is an instructional strategy in which the teachers take on the role of players while the students observe and act. In a demonstration method class, teachers explain the subject to the students step by step and demonstrate all of the processes in the lesson (Ameh, Daniel, & Akus, 2007). Several studies have looked at the impact of demonstration instructional methods on students' achievement in a variety of subjects.

Illustrations, visual aids, and the chance for questions and demonstrations are all used in the demonstration technique. The strategy permits the instructor to use activities that would be considered too unsafe for students to perform in a traditional classroom setting (Western Michigan University, 2006). The demonstration technique allows students to learn the specifics of what is being taught so that they can become proficient themselves. (Iline,2013). As a result, the researcher of this study supports the strategy because it eliminates all variables.

Demonstration teaching is an effective way of instruction since it promotes student's comprehension and retention (McKee, Williamson, and Ruebush, 2007). The demonstration is effective in teaching science students how to use instruments and conduct laboratory experiments. However, in a classroom situation, the amount of time available to perform this presentation is relatively limited. (AlRawi,2013). Instead of using hands-on labs, demonstrations are frequently structured to allow students to make observations (Ruebush, 2007).

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Because students have not been actively engaged in classroom activities, memorizing is prevalent in general science classes. It is not uncommon to encounter a student with a decent grade but is unable to connect his or her classroom experience with a real-world problem in science education (Crouch & Mazur, 2007). The reason is that he or she has not been educated through actual learning instruction. Many science professors in most of our secondary schools are specialized in science rather than science education (Omosewo, 2009). Teachers need adequate instructional strategies for teaching and frequently utilize the lecture style (Ingersoll, 2002). A teacher is given subjects for which he or she lacks proper training and qualifications (Ingersoll, 2002). Professors wish to improve their teaching methods because majority of them use lecture-based education. This lecture technique has been criticized for its lack of a participatory method which has resulted in low academic achievement in science classes. Students' performance in science topics has not been up-to the mark in recent years (Erinosho, 2013). The teaching style used by the teachers is one of the causes of this poor performance (Changeiywo &Ndritu, 2013). As a result, it is important to analyze the various types of teaching methods used in science education, their drawbacks, and the need for a paradigm shift. Demonstration may appear to be a straightforward teaching method. The teacher, on the other hand, is crucial in involving students and optimizing what they learn. The word lecture has been derived from the Latin word legere, which means "to read." Lectures are one of the most common ways to impart knowledge from books to a big group of pupils.

In past, teaching at secondary level, the lecture is one of the earliest and, may be, still most extensively utilized instructional methods. Since the very beginnings of university education, it has been a critical component of university teaching and learning programmes. Due to the increasing financial pressures on higher education around the world, the lecture will most certainly be employed widely in higher education for many years to come.

A lecture is defined as one person speaking to a group of people about a specific subject or theme for an extended period of time. A lecture is “a window in the timetable where students are taught in a nominated area, in a group that can range in size from 35 to 600 and more, and where one lecturer has the primary responsibility for ‘delivering content’” according to university personnel (Edwards, Smith and Webb, 2001). A lecture is a teaching in which the teacher is the primary source of information. In most cases, a lecturer will stand in front of a group of students and give material for them to absorb. To give visuals for pupils, teachers will write on the board or use an overhead projector. While listening to the lecture, students are expected to take notes. During most lectures, there is relatively little interaction between the instructor and the students. This theory of learning assumes that students are passive recipients of knowledge imparted by the lecturer and is described as the didactic technique in which education is the transmission of information (Ramsden, 2003). The lecture method is based on the transmissive teaching model, which states that knowledge is an object that can be passed from one person to another. It usually implies that a lecturer is giving a lecture to a group of individuals. A group is a big number of people may be educated at the same time, cutting costs. One drawback is that it does not capture as much deep knowledge as other teaching methods such as case-based learning. (Chaplin, 2009). Grunwald & Hartman 2010) are only a few examples. The retention of students in lecture-based scientific courses is poor. After the lecture,

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the average student retains only 42 percent of what he or she learned, and only 20% one week later (Bok, 2006).

The lecture method, which is often employed, does not assist students in gaining sufficient functional comprehension. The efficiency of a lecture method is inferior to that of an active learning strategy. The lecture technique encourages students to develop a negative reading habit. Students who are taught through lecture-based methods learn less than those who are taught through activity-based method (Clark and Sayre, 2014). The lecture technique is typically a one-time event with no follow-up discussion, inquiry, or practice, making it a poor teaching method (Al-Rawi, The lecture technique focuses on information rather than students (Al-Rawi, 2013). Instead of activating pupils to explore for themselves, the lecture technique instructs them on what to accomplish (Miles, 2015).

RESEARCH METHODOLOGY

The aim of the present research is to find out the effect of methods on students' academic achievement at secondary level in District Poonch AJK. This is an experimental research. Quantitative data is obtained by the post tests and then data is analyzed using one way ANOVA with SPSS. Post tests were used for data collection in the current analysis. The recent research is experimental. The posttests only, equivalent group design is used by researcher for this study. This is an effective design to minimize the experimental intensity bias. A significant difference is noticed between the achievements of the demonstration, lecture and traditional method groups. This design is one of the most efficient designs in minimizing the fears to experimental validity. It is different from other designs, as experimental and control groups are equally distributed by random equation. At the end of experimental periods, the difference of results of experimental group and control group was noticed by using one way ANOVA. It was observed that means of randomly assigned experimental group and control group from the same population have difference as a result of sampling error.

This sample of the study is a group consisted of the features of the greater population. This research denotes to a less, controllable form of a greater group. There were 30 students selected for the present study. All students were from Grade 9th studying General Science. The school no 2 was selected for research because it has big classrooms with required facilities and the management and school staff was very cooperative. The randomization procedures for the equality of the groups were followed. The marks of the students were arranged in descending order. The researcher took every third student of that order in Experimental group 1 and other in group 2, and in this way, ten students were selected for group 1 and ten students for group 2 and ten for control group. Experimental group 1 was the group which was taught by Demonstration Method and Experimental Group 2 was taught by Lecture Method and third one was control group which was taught by another teacher who was equally qualified and she taught control group, and adopted the same testing procedure as it was adopted for first 02 groups.

To find out the authentic way for teaching methods of General Science at the secondary level, the data collection methods used were post tests taken by the researchers. First of all, the researcher selected ten topics from grade 9th General science published by the Azad Jammu and Kashmir text book board Muzaffarabad. The researchers developed Lesson plan, which was consisted of

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objectives, prior knowledge, instructional material, motivation and at last evaluation. All the ten lessons were taught with Demonstration Method to group 1, and Group 2 was taught by Lecture Method by researcher. Third group was taught by a teacher of equivalent qualification of researcher with traditional method. After teaching each class, researcher took the post test for each group every day. The time period for each test was 40 minutes. The experiments were completed sensibly. Then researcher took the papers, marked all the post tests and arranged the marks of students according to three levels of domains, (knowledge, comprehension and application).The total marks for each test were 15, and overall total were 150 marks.

DATA ANALYSIS

The analysis of the data is the main progress in research. The present study analyzes the effects of Demonstration and Lecture Methods in the teaching of general science. The researcher collected the data by the post tests. Accordingly, to investigate the effects, the control group was compared with the experimental groups. For this reason, the analysis of the Mean of experimental group 1, experimental group 2 and control group data was analyzed by using the one way ANOVA, for analysis of data.

Table 1 : Overall Post Test Achievement (Descriptive)

Groups	N	Mean	Std. Deviation
Demonstration Method (Experimental Group 1)	10	111.20	30.058
Lecture Method (Experimental group2)	10	94.40	24.609
Control Group 3	10	77.10	31.143
Total	30	94.23	31.142

Table 1 shows that mean value of demonstration method (experimental group-1) (M=111.20,SD=30.06) is more than the lecture method(experimental group-2) and control group (traditional method). The mean value of lecture method (experimental group-2) (M=94.40,SD=24.60) is more than control group (M=77.10,SD=31.14). It is concluded that groups which have given treatment, have better achievement as compared to the control group. The efficiency of the demonstration method group is very solid because of the use of different types of aids. The use of demonstration method has a positive impact on achievement. Lecture method also has better results and control group have lower performance, which shows that traditional method is not improving the learning of students.

Thus the Ho hypothesis is rejected, which suggested that there is a significant difference between the achievements of both Experimental Group and Control Group. This is due to use of methods of teaching that results of the experimental group were very strong. It can be said that methods play a vital role in learning of students.

Table 2: Overall Post Test Achievement (ANOVA)

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Groups	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	5814.467	2	2907.233	3.518	.044
Within Groups	22310.900	27	826.330		
Total	28125.367	29			

Table 2 shows that F (2, 27) = 3.518, p = .044 value is significant for three groups. Hence there is a significant difference of achievement of students in overall post test in the subject of general science 9th grade. It is concluded that the demonstration teaching method is more effective than lecture and other traditional method. There is no significant difference among the achievement of students taught through demonstration, lecture methods and control group in overall posttest at knowledge level.

Table 3: Post-test Achievement at Knowledge Level (Descriptive)

Groups	N	Mean	Std. Deviation
Demonstration Method (Experimental Group 1)	10	34.90	8.595
Lecture Method (Experimental group2)	10	31.20	6.812
Control Group 3	10	25.90	8.724
Total	30	30.67	8.664

Table 3 shows that mean value of demonstration method (experimental group-1) (M=34.90,SD=8.595) is more than the lecture method(experimental group-2) and control group (traditional method). The mean value of lecture method (experimental group-2) (M=31.20,SD=6.812) is more than control group (M=25.90,SD=8.75). It is concluded that groups which have given treatment, have better achievement as compared to the control group. The values indicated that there is a significant difference between experimental groups and control group regarding the overall achievement at knowledge level. The null hypothesis is rejected, which shows that there is a significant difference in experimental and control group results. The results of experimental group are very positive because of teaching methodology.

Table 4 Post-test Achievement at Knowledge Level (ANOVA)

Groups	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	409.267	2	204.633		
Within Groups	1767.400	27	65.459	3.126	.060
Total	2176.667	29			

Table 4 shows that (F (2, 27)=3.126, p= .060) value is not significant for three groups. Hence there is a significant difference of achievement of students in all over post test at knowledge level in the subject of general science 9th grade. The value is not significant because knowledge is very basic level. Students of each

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group memorize it easily. It is concluded that the demonstration teaching method is more effective than lecture and other traditional method. There is no significant difference among the achievement of students taught through demonstration, lecture methods and control group in over all post test at comprehension level.

Table 5: Post-test Achievement at Comprehension Level (Descriptive)

Groups	N	Mean	Std. Deviation
Demonstration Method (Experimental Group 1)	10	32.10	7.109
Lecture Method (Experimental group2)	10	28.00	7.542
Control Group 3	10	23.30	7.573
Total	30	27.80	8.032

Table 5 shows that mean value of demonstration method (experimental group-1) (M=32.10,SD=7.109) is more than the lecture method(experimental group-2) and control group (traditional method). The mean value of lecture method (experimental group-2) (M=28.00,SD=7.542) is more than control group (M=23.30,SD=8.032). It is concluded that groups which have given treatment, have better achievement as compared to the control group. It shows a clear difference between the groups. Thus null hypothesis is dismissed which suggested that there is a significant difference between the achievement of both experiment groups and control group at achievement at comprehension level. It was due to methodology which is used in experimental groups.

Table 6: Post-test Achievement at Comprehension Level (ANOVA)

Groups	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	387.800	2	193.900		
Within Groups	1483.000	27	54.926	3.530	.043
Total	1870.800	29			

Table 6 shows that (F (2, 27)=3.530, p= .043) value is significant for three groups. Hence there is a significant difference of achievement of students in overall post test at comprehension level in the subject of general science 9th grade. It is concluded that the demonstration teaching method is more effective than lecture and other traditional method. There is no significant difference among the achievement of students taught through demonstration, lecture methods and control group in overall posttest at comprehension level.

Table 4.27:Post-test Achievement at Application Level (Descriptive)

Groups	N	Mean	Std. Deviation
Demonstration Method (Experimental Group 1)	10	44.20	15.230
Lecture Method (Experimental group2)	10	35.20	12.200

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Control Group 3	10	27.90	16.024
Total	30	35.77	15.615

Table 7 shows that mean value of demonstration method (experimental group-1) (M=44.20,SD=15.230) is more than the lecture method(experimental group-2) and control group (traditional method). The mean value of lecture method (experimental group-2) (M=35.20,SD=12.200) is more than control group (M=27.90,SD=16.024). It is concluded that groups which have given treatment, have better achievement as compared to the control group.

Table 8: Post-test Achievement at Application Level (ANOVA)

Groups	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	1333.267	2	666.633		
Within Groups	5738.100	27	212.522	3.137	.060
Total	7071.367	29			

Table 8 shows that (F (2, 27)=3.137, p= .060) value is not significant. Hence there is a significant difference of achievement of students in overall post test at application level in the subject of general science 9th grade. The value is not significant because application level is higher than knowledge. The students of secondary level are not able to apply things properly. I found this gap that students of this level cannot make application properly, we have to teach them that how to apply the things. It is concluded that the demonstration teaching method is more effective than lecture and other traditional method.

CONCLUSIONS

The current study demonstrated the effects of demonstration method and lecture method on students' performance in General science of 9th level at secondary schools in the district Poonch AJK. Because of the persistent improvement in the field of teaching, this kind of study in the field of training must be completed at different levels.

The use of demonstration method has a positive and critical effect on the learning and it is found in the recent research that it effects the student's accomplishment in the overall general science book at the level of secondary school. It flourishes students with the learning atmosphere to upgrade their inside other than secondary level general science course books.

In the present research, the researcher explored that students at secondary level are keen for the learning of demonstration method in the study of general science. It promotes the open methodology of education, real material utilization and presents different students encounters. It explores the learning climate through correspondence and develops there insight at the secondary level. It was seen from their general posttest that they got better results in all or three phases of Cognitive Domain (knowledge, comprehension, application). It was considered that demonstration method is better than traditional method. The present study indicated that the achievement of the Experimental Group 1 was splendid as

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compared to lecture method (Experimental Group 2). The achievement of Experimental Group 2 was better than the control group (traditional method). The results were the proof of the significant and positive effect of the Demonstration Method in the secondary level of General Science in district Poonch Rawalakot AJK.

RECOMMENDATIONS

On the basis of research findings, some recommendations are given by researcher to make the teaching methodology more useful for the students.

1. It is recommended that Education Administrator should provide the trainings for new methodologies in all schools and make it compulsory to use them at the secondary level in the teaching of general science.
2. It is recommended that secondary teachers especially science teachers should use Demonstration Method during science class.
3. It is recommended that principals of the schools should provide necessary equipment for the Demonstration method to improve teachers teaching methods.
4. It is recommended for the teachers that they should use Demonstration method to improve the learning of students.
5. It is recommended for the management of education schools that they should ensure the use of Demonstration method in the teaching of general science.
6. It is recommended that school management should ensure that teachers should use demonstration method of teaching in general science classrooms.
7. It is recommended for future researchers to study this topic with additional variables at broader level in AJK and Pakistan. As the current study was delimited to District Poonch secondary level students only.

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