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Implementation of Teaching Skills Learned by Trained Teachers for Teaching Science Subjects at Secondary School level

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Abstract: The given study aimed collecting facts and information about the state of professional competence of science teachers in secondary schools, and its effectiveness to communicate the requisite knowledge; where in the extent of the training given to the teachers for teaching science in secondary school is to be determined. The data was collected from nine private and nine public secondary schools located in Karachi by interviewing 54 trained teachers selected through convenience sampling, having a Bachelor of Education (B.Ed.) degree and who were teaching science subjects at secondary level of school. The results reveal that there is less coordination between the actual teaching of science in secondary schools in Karachi and the training given to the teachers for teaching science although the government spent a lot of money on this training. The ineffective teaching is due to lack of; teaching aids, laboratory facilitates in schools, and lesson planning by teacher. Mostly teachers explain the experiments through text book only. It is recommended that the schools should be supplied with audio visual aids and necessary laboratory equipment, and the teaching load on the science teacher is reduced to have enough free.

Keywords: Teaching skills, Trained teachers, Teaching science

Introduction

A considerable number of student in our country Pakistan are not much interested in learning science subjects because they know very little about its importance and take it as a difficult subject. There are many reasons for that. One of these may be that the teachers do not teach the students in an effective way. The knowledge is given to the students only with the help of prescribed text-books. The opportunities of performing experiments are not provided to the students whereas science is based on facts which can be proved by experiments.

The teachers teach science subjects without demonstrating the experiments. Although they are trained to teach science with demonstration method, Heuristic method etc. but they do not use these methods in actual teaching and neglect the psychological needs of the students. The result of teaching Science without demonstration is that the students do not understand the facts, therefore, the curiosity of getting further knowledge diminishes. The question arises why the teachers do not use these methods which had taught them during their professional training in actual daily teaching or why there is a divergence between the training and day to day actual teaching on the job.

This is the age of science and technology. If we want to develop our country, we must make progress in the field of science and technology. It is possible only when our students take interests in areas of knowledge. New inventions are coming up almost every movement. But how? Not without tears and perspiration. Different experiments are performed to prove different facts and to make new discoveries. But the students themselves in our schools do not have an opportunity and inspiration to perform the simplest experiments, which they can without the help of laboratory equipment.

They are reared to learn through rote memory or they are negligent to what has been taught puts an embargo on their curiosity which could have otherwise help them to develop their mind on an intellectual plane. Therefore, it is required to train the teachers in such a way that their training may have no conflicts with the actual teaching in the class room.

The teachers should be trained to teach by such methods which can produce curiosity and interest in students even in the absence of facilities. We are poor in resources and our schools cannot afford to build up the expensive laboratories. The schools cannot provide requisite equipment for the students. Many methods of teaching science cannot be used in our schools because of the same reason. It is therefore required to use only those methods which suit to our environmental conditions.

The given study aimed collecting facts and information about the state of professional competence of science teachers in secondary schools, and its effectiveness to communicate the requisite knowledge; where in the extent of the training given to the teachers for teaching science in secondary school is to be determined.

The specific objective of the research is to find out whether the training given to the teachers for teaching science is applied in our secondary schools or not. If not, then, the objective is always the cause of its failure.

Method

This was an exploratory research and the researcher selected stratified random sampling. The researcher collected data from nine private and nine public secondary schools located in Karachi. Three trained teachers having a Bachelor of Education (B.Ed.) degree and who were teaching science subjects at class VIII, IX and X were selected through convenience sampling from each school thus making sample size as 54 trained teachers. The data was collected with the help of structured questionnaire by interviewing the respondents.

The items of questionnaire were closed ended to secure uniformity of response patterns. To secure the reliability of the questionnaire, the language of the items was kept simple and straight forward and pretesting was made on five B.Ed. science teachers teaching at secondary level. The questionnaire consisted of thirteen closed ended items. In this study, % method was used for analyzing data.

Results and Discussions

The findings of the study are given below in table number 1- 9 based on research questions.

Research question 1: How do school plan, organize and schedule classes for effective teaching of science subjects?

Planning, organization & schedule of classes was identified through; number of students in class., duration of science period and number of science periods per week in time table.

Table 1. Number of students in class and duration of science period

	Response	N	%
No. of students in class	10 - 19	02	3.70
	20 - 29	02	3.70
	30 - 39	04	7.41
	40 or above 40	46	85.19
	Total	54	100
Duration of science period	30 minutes	42	77.78
	35 minutes	12	22.22
	Above 40 minutes	00	00
	Double period	00	00
	Total	54	100

Table1 shows that majority of the teachers (85.19%) had 40 or above 40 students in their class. The table also shows that none of the teachers have science period above 35 minutes duration; none of the teachers have double period of science. And majority of the teachers (77.78%) have science period of 30 minutes duration.

Table 2. Number of science periods and free period

	Response	N	%
Number of Science periods in a week	4-5 periods	36	66.67
	Above 5 periods	18	33.33
	Total	54	100
Teachers having a free period before taking science period	Always	12	22.22
	Sometimes	36	66.67
	Never	06	11.11
	Total	54	100

Table 2 shows that majority of the teachers (66.67%) have 4-5 periods/week and majority of the teachers (66.67%) have free period before taking science period only sometimes.

Conclusion: Teaching of science subjects was not effective due to overcrowded classes, short duration of science periods and insufficient number of science periods.

Research question 2: What facilities are provided by school for effective teaching of science subjects?

Facilities provided by school for effective teaching of science subjects were measured in terms of; having all the laboratory equipment and chemicals, charts, models and other teaching aids.

Table 3. Facilities at school

	Response	N	%
Having all lab. Equipment and chemicals	Yes	06	11.11
	No	48	88.89
	Total	54	100
Having charts, models and other suitable gadgets	Yes	06	11.11
	No	48	88.89
	Total	54	100

Table 3 shows that majority of the schools do not have all laboratory equipment and chemicals and charts, models and other teaching aids according to the syllabus (88.89% each).

Conclusion: Teaching of science subjects was not effective due to the lack of teaching aids and lack of laboratory facilitates in schools.

Research question 3: What teaching strategies are used by teachers for effective teaching of science subjects?

Teaching Strategies used by teachers for effective teaching of science subjects included; planning lessons, starting lesson based on previous knowledge, and use of questioning skills by teacher throughout teaching.

Table 4. Teaching strategies used by teachers

	Response	N	%
Teaching through lesson planning	Yes	12	22.22
	No	42	77.78
	Total	54	100
How to begin a new lesson	Response		
	Introducing the new lesson with questions from previous knowledge	04	7.41
	Directly introducing a new lesson	50	92.59
	Total	54	100

Table 4 shows that majority of the teachers (77.78%) do not use lesson planning technique in teaching and majority of the teachers (92.59%) do not use the principles of effective teaching based on previous knowledge.

Table 5. Use of questioning skills by teacher throughout teaching

Response	N	%
During the stage of presentation	10	18.52
During the stage of recapitulation	40	74.07
Both during presentation and recapitulation	04	7.41
Total	54	100

Table 5 shows that only 18.52% teachers ask the question during the stage of presentation and 74.07% ask the questions during the stage of recapitulation. So, all of them do not use questioning throughout teaching. Only few i.e. 7.41% teachers ask the question both the time, so they use questioning skills necessary for effective teaching.

Conclusion**:** Teaching of science subjects was not effective due to lack of lesson planning by teacher, lack of introducing a new lesson based on previous knowledge and lack of questioning skills by teacher.

Research question 4: What teaching methodologies are used by teachers for teaching science subjects?

Teaching methodologies used by teachers for teaching science subjects included; teaching with the help of science text book in class, reading from the text book during teaching, use of laboratory for necessary preparation before teaching a lesson, and methods used by teacher for explaining the experiments.

Table 6. Teaching through science book in class

Response	N	%
Always	44	81.48
Sometimes	06	11.11
Never	04	7.41
Total	54	100

Table 6 shows that majority of the teachers (81.48%) always take the help of Science book in the class to explain the lesson.

Table 7. Reading from the text book during teaching

Response	N	%
Lesson reading from the text book by the students	28	51.85
Lesson reading from the text book by the teacher	16	29.63
Lesson reading from the text book by both turn by turn	10	18.52
Total	54	100

Table 7 shows that majority of the teachers (48.15%) take the help of students for reading the lesson from the text book.

Table8. Use of laboratory before teaching a lesson

Response	N	%
always	00	00
sometimes	06	11.11
Never	48	88.89
Total	54	100

Table 8 shows that majority of the teachers (88.89%) never go to lab for making necessary preparation before teaching a lesson.

Table 9. Method used by teacher for explaining experiments

Response	N	%
With the help of charts	08	14.82
By oral method i.e. without any teaching aid.	44	81.48
By actually doing the experiment by the teacher in class room	02	3.70
By actually doing the experiments by the students in laboratory under the guidance of teacher	00	00

	Total	54	100

Table 9 shows that majority of the teachers (81.48%) orally explain the experiments. There is no such teacher whose students perform the experiments by themselves under the guidance of teacher.

Conclusion: Teaching of science subjects was not effective due to use of recitation method of teaching science, lack of use of laboratory method for teaching science and explaining the experiments through text book only.

If we see the actual teaching of science in secondary schools in Karachi and the training given to the teachers for teaching science, we come to know that there is less coordination between the two. There may be many reasons for that as given below.

In actual daily teaching, every teacher must take five to six periods daily whereas the science teacher should have enough free periods for the preparation for performing the experiments. Specially teacher should have a free period just before the period in which she/he must teach science. In that period the apparatus can be set for performing the experiments and to save time.

Duration of the period is not enough to perform the experiments. In our schools the duration of a period is between 30 minutes to 35 minutes and this time is not enough to perform any experiment.

In teachers' training college/institute the prospective teachers are told to prepare the lesson notes before taking a class, during the practice of teaching. But in actual teaching the teachers do not prepare the lesson notes because if they do this, then they will be able to complete only a small portion of the syllabus, whereas the schools in our country also remain closed off and on.

Facilities are provided by school for effective teaching of science subjects

For effective teaching teachers use audio visual aids, charts, models, etc. but in our schools specially in the Government Schools there are no teaching aids at all. In the laboratories the equipment is very few and not enough for all the students. Fraser, Classroom & School climate (1994), affirms the importance of activities and experiments-based science studies always encourages healthy learning. Studies show the importance of classroom environment which contribute to the alteration in the psychological factors of students and emotional outcomes (Walberg, 2004) and effect student accomplishment and attitudes (Walberg, 2006).

Teaching strategies used by teachers for effective teaching of science subjects

During the training the teachers motivate the students before starting the lesson but in actual teaching the teachers do not care about it. They directly write the topic on the black-board or orally tell the topic. In teachers training the teachers are not allowed to take the book to the classroom. They prepare the lesson and learn by heart the subject matter. In actual teaching the teachers usually adopt the recitation methods in which passages from the text book are read loudly by the teachers or by the students in the class. According to the training the teachers should start a new lesson by asking the questions from previous knowledge where as in actual teaching the teachers directly start a new topic. The teachers are trained to ask the questions during presentation and recapitulation but in actual teaching majority of the teachers do not ask the questions both the times. They ask the question only during the stage of recapitulation and not during presentation to save the time. The skills of the teaching acquired during training are not utilized by the teachers in actual teaching.

Teaching methodology

The study highlighted that new methods of teaching like laboratory method, Heuristic method and demonstration methods are not used by the teachers due to the large no of students, lack of teaching aids and other resources, small duration of science periods etc. Instead of that recitation method or lecture method is commonly used. Many researchers criticized lecture method as a one – way communication process which lacks discussion, questioning or immediate practice (Hatim, 2001; Al-Rawi, 2013), subject centered rather student centered (Al-Rawi, 2013), based on instructions given by teacher rather exploration by students (Miles, 2015), lacks active learning approach (Berry, 2008), causing bad reading habit among the students (Fagen & Mazur, 2003) and lacks activity based learning (Franklin, Sayre, & Clark, 2014).

Many researchers argued the usefulness of demonstration method of teaching as; it improves students' understanding and retention (McKee, Williamson, & Ruebush, 2007), it is effective in teaching skills of using tools and laboratory experiment in science (Al Rawi, 2013). However, the time available to perform this demonstration is very limited in a classroom setting. Therefore, a demonstration often designed to allow students to make observations instead performing themselves (McKee, Williamson & Ruebush, 2007).

The finding show that new techniques of training are not used by the teachers due to the shortage of time. These techniques take a long time and the schools in our country remain close off and on so the syllabus cannot be finished in time if these techniques are used by the teaches. Miles (2015) argued that a teacher need to use variety of instructional strategies to bring academic success to science students. Similarly, Nguyen, Williams, and Nguyen (2012) emphasized the use of a teaching method that is based on social interaction between students and teacher for effective learning and achieving good results. Tobin (1990) stated that the laboratory method of teaching enables students to learn science concepts by doing various activities.

Conclusion

The results concluded that there is a lack of coordination between the actual teaching of science in secondary schools in Karachi and the training given to the teachers for teaching science although the government spent a lot of money on this training. The ineffective teaching is due to lack of; teaching aids, laboratory facilitates in schools, and lesson planning by teacher. Mostly teachers explain the experiments through text book only. It is recommended that the schools should be supplied with audio visual aids and necessary laboratory equipment, and the teaching load on the science teacher is reduced to have enough free time for the preparation of experiments in the laboratory.

Recommendations

The number of science teachers should be increased so that the teaching load on the science teacher is reduced and to have enough free time for the preparation of experiments in the laboratory. The ratio between the number of students and number of teachers should be appropriate so the teachers can pay individual attention to the students. The number and duration of science periods should be increased. The science teachers should have double periods of science to perform the experiments easily. They have a free period just before taking the science period so that they can do the necessary preparation for performing the experiments. Science teacher should be given workload in a way to prepare short outlines for teaching 4-5 science lessons per day. All the schools should be supplied with audio visual aids and necessary laboratory equipment. The teachers can also take the help of the students in preparing teaching aids. The research on this topic should be done on a large scale to find out the reasons that why the teachers training is not utilized by the teachers although the government spent a lot of money on this training.

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