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ANALYZING THE EFFECTS OF SCIENCE TEACHING METHODS ON STUDENTS' ACHIEVEMENTS: A STUDY OF SECONDARY SCHOOL TEACHERS OF DISTRICT KHAIRPUR MIR'S

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Abstract

The research paper designed to investigate the effects of science teaching methods on the achievements of students of secondary schools of district Khairpur. Quantitative methodology has been used for this paper. This study focuses on the methods used by the science teachers and their effects on the achievements of secondary schools. It is found that the teachers use old traditional methods, rely completely on the text books, don't engage students in projects, group discussions and activities. The study recommends that teachers should be multiple methods keeping in view contents, they should encourage students' participation more in the class room.

Keywords: Teachers, Science Teaching Methods, Student's Achievements

Introduction

Science is considered as a core subject at secondary schools in Pakistan. Science teaching in schools of Sindh is carried out with a list of problems; Science text books at schools and colleges are outdated and uninteresting as well, not only this but these are poorly printed and overloaded with bulk of knowledge. These text books are not designed according to the modern needs of the students and contributing less into the intellectual growth and science attitude is not developed among students from initial phase of learning. The text books lacking graphical presentation of the things aligned with contents which should develop a curiosity among students to study self at home. Beside text books another greater problem is lack of skills among science teachers in teaching science contents with demonstration. Nayer (2016) expressed that majority of the teachers are not professionally trained and unable to deliver the ideas in inspiring way.

Due to lack of knowledge these teachers kill curiosity and always discourage learning through asking and questions. Science has been taught through different subjects at secondary school level such as Physics, Chemistry and Biology. Science subject helps students to develop the skills such as observations, experiment, critical thinking, problem solving techniques and it develops practical work strategies. Students will learn new theories to emphasize

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the skills of manipulating the physical world, they will inculcate reasoning from data because the students study in an innovative way to introduce unique ideas and to think over then and observe them.

The principle reason for instructing to any level of training is to acquire a vital change in the study (Baviskar, 2009). To construct basic techniques for learning correspondence, instructors must apply appropriate instructional strategies that mostly suit to adjust targets. In the anticipated age, educator focused techniques to convey data to learners in respect to focused approaches. Till today, inquiries regarding the productivity of showing plans on understudy learning have constantly brought extensive consideration up in the topical field of instructive research.

Research Questions

a. What are the beliefs of teachers teaching science as a subject at secondary schools?
b. What methods are practiced by teachers while teaching science subject?
c. What are effects over students while teaching science as a subject?

Literature Review

Even though the academic activities can be energizing engines to motivate students to be successful in their life long goals. Previously studies have been conducted in which it has been argued that (Durik & Harackiewicz, 2007; Reeve, 2002) "teaching methods that allow the teacher to be responsive (e.g., spending time listening), supportive (e.g., praising the quality of performance), and flexible (e.g., giving students time to work in their own way) are optimal for interest development". Methods have great significance in attaining the desired learning outcomes. Without proper methods content knowledge will not be delivered properly. "Teaching methods that allow this kind of teacher–student interaction promote internalization of the aims and goals of the curriculum, which is essential for the development of individual interest (Hidi & Renninger, 2006; Krapp, 2003)".

Science teaching is carried out at schools of Sindh mostly by lecture method which is most uninteresting way to teach that core subject. Lecture methods always in science teaching make students less attentive and less focused because it does not practice practical work and laboratory experiments. Bok (2006) expressed "an average student only retains 42% of what he or she learned after the end of the lecture and 20% one week later". "Research shows that teaching method like the lecture method commonly used does not help the students to acquire sufficient functional understanding" (Bernhard et al., 2007). This show that lecture method does not make students proactive and creative in their teen age. It is alarming that students at this tender age are not proactive and creative then they will be less creative in their rest academic life. Berry (2008) argued that lecture method lacks the effectiveness of an active learning approach.

In the opinion of Fagen and Mazur (2003) "lecture method causes the bad reading habit among the students". Franklin, Sayre, and Clark (2014) expressed "students taught in lecture-based classes learn less than those taught with activity based reformed methods". "Lecture method is frequently a one – way process unaccompanied by discussion, questioning or immediate practice that makes it a poor teaching method" (Hatim, 2001; Al-Rawi, 2013). "Lecture

method concentrates on information rather than learners (Al-Rawi, 2013). “In the lecture method the teacher tells the students what to do instead of activating them to discover for themselves” (Miles, 2015).

This indicates that the arousal of students’ self-interest and motivation to learn depends upon the methods of teaching science subject. Exceptional growth has been created in conceptualizing, evaluating and investigating its factors and effects. Significant work has been done on the evaluation and examination of classroom conditions in resources with a spread of instruments (Fraser 1994). Investigation during recent years has perceived that the two understudies and educators' ideas are key parameters of the normal and mental parts of the instructive situation of classrooms (Fraser, 1991). Fraser, Classroom & School climate (1994), affirms the importance of activities and experiments based science studies always encourages healthy learning.

Miles (2015) argued “it is expected for a teacher to implement a range of instructional strategies that will bring academic success to all the science students. For any method to be able to bring good result in the present age, it should be a method that promote maximum social interaction”. “Social interaction between students and between teacher and student plays a crucial role in learning” (Nguyen, Williams & Nguyen, 2012).

There is dire need to revisit the teaching methods at secondary schools because developed ideas and attitude laid the foundation of the life time career and academic performances so tender age learning matters a lot. “Demonstration teaching method is a useful method of teaching because it improves students' understanding and retention (McKee, Williamson & Ruebush, 2007). According to Al Rawi, 2013) “the demonstration is effective in teaching skills of using tools and laboratory experiment in science. 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 rather than through hands-on laboratory” (McKee, Williamson & Ruebush, 2007).

In modern times there should be established laboratories for science teachings at schools because laboratories are known as practical learning houses in schools. Tobin (1990) expressed “laboratory activities appeal to learn with understanding and, at the same time, engage in a process of constructing knowledge by doing science”. He also suggested that meaningful and quality learning is possible in the laboratory if students are given opportunities to manipulate equipment and materials to be able to construct their knowledge of phenomena and related scientific concepts.

Science schoolroom surroundings regarding the common view of the researchers and scholastics. In this condition, has the twin favorable position of delineating the setting through the eyes of the givers and getting data that the watcher may see inconsequential. Understudies have a fair preferred standpoint to make judgments concerning classrooms in view of the need experienced numerous option learning conditions and have enough time in an extremely classification to establish redress connections.

Likewise, Walberg (2004) in his theory given on the topic of instructional productivity consists of classroom with the surroundings factors which contribute to the variance in the psychological factors of students and emotional outcomes. The inverse elements measure up the capacity, development, and inspiration. The standard of direction, the

quantity of guideline, the mental surroundings gathering, and the peers out of the classroom, and the time related with the video/TV media (Walberg, 2004).

The model was tested successfully as a part of national study which showed that the factors of student accomplishment and attitudes are both highlighted together by these factors (Walberg, 2006). The solution was found out that the school and college environments were both extremely influences on the student achievement.

However, despite the existence of ancient science schoolroom surroundings analysis at the first and secondary level, (Williams, 2007). Surprisingly very less work has been completed at the higher education levels (Dorman, 2000a); (Dorman, 2000b); (Margianti, 2000); (Nair, 1999).

The old idea of a typical learning surroundings by all students inside a classroom was challenged once more within the half of the Nineteen Eighties. For instance, in instructive studies using classroom learning surrounding instruments, various classroom observations and interviews comprises of academics and students (termed "target" students).

United Nations agency was found out to possess much favorable perceptions of the educational steps, then those students who are not concerned, giving a suggestion that there might be distinct and differently-perceived learning environments in one classroom (Tobin, 2007). Different studies (Tobin, 2007); (Tobin, 2000) additionally steered the attractiveness of getting a replacement sort of a tool that is healthier than, that the standard category type for measuring variations in insights which may be controlled by totally diverse students inside a similar category.

Research Methodology

This study has been carried out to investigate the multiple effects of teaching methodologies of science subject on students' achievements, and to find out the effective teaching methodologies to teach in future science subject effectively at schools. The study has been conducted by collecting data from N=16 Government secondary schools of district Khairpur Mir's. The data has been collected by conducting a survey. The tool for survey was Questionnaire. The data was quantified by SPSS (version18). In this research study equal share has been given to male as well as female teachers of the secondary schools. The study has scope because no one has conducted study before in that context. The population has been selected consciously where science subject has been taught as a core subject. The teachers were informed about the purpose of the study in order to ensure validity of the research. the study has been designed in which Teaching methods is independent variable while students' achievement is dependent variable.

The study has been carried out in N=16 public schools of District Khairpur Mir's, Sindh, Pakistan. Teachers (male and female) of high and higher secondary Schools of District Khairpur Mir's Sindh (Pakistan) during session 2015-2016 were population of this Survey study.

There were sixteen (16) science teachers of Schools of District Khairpur Mir's during the session 2015-2016. The sample was divided/categorized into two equal groups under the origin of an achievement from the male and female science teachers.

Data Analysis

S. #.	Item	SA	%	A	%	U	%	D	%	SD	%
1	It is good to use teaching aids for teaching science subject.	8	50	6	37.5	2	12.5	0	0	0	0
2	Observational and critical thinking skills developed through science teaching.	10	62.5	5	31.2	1	6.05	0	0	0	0
3	Science teaching helps in developing knowledge about physical world around.	5	31.12	3	18.75	3	18.75	4	25.0	0	0
4	I use different techniques to satisfy students questions.	10	62	4	25	0	0	2	12.5	0	0
5	I distribute students in small groups for discussions.	6	37.5	3	18.75	0	0	4	25.0	3	18.75
6	I assign home works to the student's and other practical works	5	31.5	3	18.75	1	6.25	5	31.25	2	12.5
7	I use text books rather than laboratories for teaching science	10	62	5	31.5	1	6.25	0	0	0	0
8	I always make explicit relationship between today's and the previous discussed topic.	5	31.5	3	18.75	1	6.25	4	25.0	3	18.75
9	I use charts, pictures, physical objects and other relevant materials to teach science subject.	4	25	2	12.5	1	6.25	5	31.5	4	25
10	I like teacher centered approach in teaching science subject	12	75	4	25	4	25	0	0	0	0
11	I manage a class in discussion method for achievements.	4	25.0	5	31.25	2	12.5	3	18.75	2	12.5

12	I manage students in class by activity based method for achievements.	5	31.5	6	37.5	2	12.5	2	12.5	0	0
13	Science teachers manage a class of students in project base method for achievements	5	31.2	4	25	1	6.25	4	25	2	12.5
14	From lecture method students learn more as compared to using discussion method, activity base method, project base method	8	50	6	37.5	2	12.5	0	0	0	0
15	Science teacher manage a class of students in project base method.	4	25	3	18.75	1	6.25	5	31.5	3	18.75

Analysis of the Results

The statistical results are interesting regarding teaching science subjects at the schools. With response to the statement 01, 50% respondents are strongly agreeing that is good to use science teaching aids for teaching science subject, 37.5 % are agreed, which indicate good number of teachers use teaching aids teaching science subject while 12.5% are undecided which indicate a good number of non-availability of teaching aids in school for teaching science subjects.

In response to the statement 3, 31.12% respondents are strongly agreeing and 25% agree which indicates majority of the teachers have belief in positivity of science subject and its effects while 25% teachers are disagree to the statement which indicates that the teachers consider other subjects important as well having great significance. In response to the statement 4 I use different techniques to satisfy students' questions, shows that 62% are strongly agree, 25% agree which indicates a good number of teachers use different techniques while 12.5% are disagree which shows that a good number of teachers don't use different techniques to make science teaching more effective.

In response to the statement 5, 37.5% are strongly agree and 18.75% are agree which indicates that majority of teachers use group discussion in their class for teaching science subjects while 25% Disagree and 18.75 are strongly disagree indicate that student focus on lecture method where their role is authoritative rather than student centered which discourages healthy involvement of students for learning Science subject. In response to the statement 6 half percentage of the teachers assign students homework while 6.25% are undecided and 31.2% are Disagree and 12.5 % are strongly disagree that shows that a good number of teachers do not assign homework to students for their creativity and involvement in learning Science subject.

Statement 7 shows that majority of students use only text books rather than laboratories for teaching science subject. Statement 9 indicates that 25% teachers are agree and 12.5% are strongly agree that they use different teaching aids for teaching science subject. While 31.5% are disagree and 25% are strongly disagree that shows teachers in majority use only text book to teach that subject and do not use other additional sources to make sense clear for different abstract ideas. Statement 10, indicates that majority of the teachers use teacher centered approach rather than student centered, group discussion or activity based. Statement 13, 14 and 15 indicates that less number of teachers focus on project base or activity based learning in science teaching while majority of the teachers teach through lecture method which is considered a passive method for teaching science subject.

Findings

Teaching at secondary schools has a great significance in developing ideas, clearing concepts and developing attitudes for every discipline. Methods always helps in attainment of the outcomes of each course. If methodology has not been properly utilized by the teachers, then the foundation of the subjects will not be stable. This study has great significance because it analyses the teachers' way to teach and different practices used by them for teaching core subjects. By analyzing the statistical results, the following results have been found;

It is found that teachers use different aids while teaching but the non-availability of the teaching aids is the major issue to carry out teaching methods in a proper way due to lack of availability of resources.

The responses indicate that 62.5 % teachers strongly agree to the statement and believe that science teaching helps in developing the creative and critical thinking skills among students which seems a positive attitude of science teachers towards science subject.

Statement 5 indicates that 25% disagree to the statement that distributing to the students among group will not lead them towards healthy learning which shows that teachers don't engage students in activities and group discussions for self-learning and critical thinking skills.

Statement 7 indicates that 62% Teachers strongly agree that they use only text books rather than labs for science practical works and they rely only on the text books only as a source of carrying out teaching and learning process.

Though schools don't have resources or science laborites but majority of the teachers even do not use pictures and charts for teaching science subjects which is an alarming situation. Statement 10 indicates that 75% teachers strongly believe that teachers practice teacher centered approach rather than students centered approach.

Statement 12 indicates that secondary school teachers never focus on project based learning in science subjects even at secondary level. Statement 14 indicates that Teachers use only old traditional methods; lecture method for teaching science subject.

The results indicate that there are multiple reasons which effect over students poor learning process. Teachers are lacking in their proper science teaching methods and they rely upon only text books rather than activities, group

discussions or project based learning which results in demotivation and lacking in development of the creative and critical thinking skills. These various reasons effect over students' greater achievements in their academic life and do not motivate students to study willingly at home. It has been recommended that teachers should use different teaching methods keeping in view the contents. Teachers should encourage students' participation in different activities and science based projects. If there is non-availability of resources, then teachers should bring charts and pictures to develop clear understanding among students. Teachers should distribute students in groups to question and argue on different topics.

Conclusion

This small study has been conducted to analyze the effects of teaching methods of science subjects at secondary level over students. This study has a broader scope because this study is analyzing the effects of science teaching methods over students. This study has been conducted in the rural setting of District Khairpur.

The findings of the study indicate that the majority of the teachers use old methods to teach science subject and only rely over the text book as source of teaching science which results in less growth of critical thinking of the students. Teacher's don't use activities, projects and group discussions for the clarity of students in abstract ideas. Teacher have authoritative role in the classroom still which results in less participation of the students. It is found quite good that science teachers believe that the critical thinking, observational skills and social and intellectual development of the students is possible by teaching science subject. Science teachers believe that the development of skills and knowledge in students is the most important objective in science subject. When students do not understand topics then science teacher distribute students in small group for understanding topic. It is recommended that students should be given science homework and practical work.

The research study has been conducted in local context of district Khairpur and the findings of the study can be applied in other local schools as well as other similar secondary schools of Sindh. Teachers should encourage students' participation and learning innovative ideas.

Recommendations

i. Government should provide the teaching aid material to teacher for using in the class.
ii. Science teacher should always distribute students in small group for discussion of difficult topics.
iii. Science teacher should use science laboratories for practical work but there no such concept of science laboratories so government should allocate the funds for the construction of science laboratories in the schools.
iv. Head of the institutes emphasizes the science teacher to use students center teaching rather than teacher center teaching, because in the teacher center learning students are passive and when students are passive they can't understand the topics.
v. Science teacher should use activity base, group discussions or project based learning rather than textbook reading method.
vi. Science teacher should bring charts and pictures to develop clear understanding among students.

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