A STUDY ON THE TEACHING DIFFICULTIES IN PHYSICAL SCIENCE AT SECONDARY SCHOOL LEVEL.

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ABSTRACT

There is a lack of mutual understanding of the school function and mission. The principal should make the mission and vision of the school to student, teacher, parents and community so the principal should place a program and should hold a meeting on weekly or monthly bases to provide opportunity with one another in open sessions. Teachers are not in contact with one another. So the principal should organize the ideas of the teachers to jointly work for the school mission.

KEY WORDS: Physical science, Teaching Difficulties, Secondary School, High School Teachers,

Introduction

Physical Science is one of the most exquisite branches of natural sciences, which plays a pivotal role in development, flourishing and prosperity of human being. At secondary level Physical science subject has the same spirit. The teaching of Physics at Secondary level is not fruitful and a number of elements or factors are responsible for it's wore seining.

Methods for Teaching Physics

There are various methods for teaching physical science. But for the teaching of Physical science we must choose those methods that are especially suitable for this subject. We cannot use a single method for the teaching of Physical science. The teacher must have various methods for best result. But this combination should be in accordance with the mental calibre of students in different classes and grades as there are a number of methods which are only suitable for particular classes and grades, as different methods develop different skills in the students.

Dr. Mehmuda Rehman has suggested a number of teaching methods in her book “Teaching of science and mathematics”. She writes “the innovative methods, which are important for the science, and practice classes are as follows lecture method, demonstration method, project method, laboratory method, problem solving, programmed learning, microteaching”.

The Teachers of Physics

Physical science being an important and complex subject needs competent and expert teachers who are trained in various teaching methods that are suitable for the teaching of science and especially Physical science.

Mr. Wali-Ud-Din writes in his book ‘Teaching of science in the secondary schools of Pakistan’. “Qualities of a good science teacher are that he should have a sound philosophy of education in which he has complete faith. He should have an understanding how pupils learn. He should possess necessary skills in instructional methods. He should have an ability to communicate ideas. He should have knowledge of the subject matter. He should have creative imagination. He should have a well integrated personality.” P-76

The above paragraph suggests that a teacher of Physical science must be an aware person and should have all those necessary skills that are needed for the efficient teaching of Physics. While teaching the subject of Physics, a teacher should focus on the following steps that are regarded vital for learning Physical science:

Use of Audio-Visual Aids in the Teaching of Physical Science

Literally “audio” means “to hear”, “visual” means “to see” and “aids” means the helping materials”. In teaching learning process, “audio/visual aids” are those materials which can make the teaching – learning process easier.

Dr. Mehmuda Rehman, in her book “Teaching of science and mathematics” has defined audio-visual aids as such: “All such aids which endeavour to move the knowledge clear to us, through our senses and called as the audio-visual aids”.

As we learn through our senses, audio-visual aids make the learning situations as real as possible and give us firsthand knowledge through hearing a

seeing. Thus audio-visual aid is a useful technique to make the learning more concrete, more realistic and more dynamic.

The following audio-visual aids have been recommended by "John S. Richardson" in his book "Science Teaching in Secondary Schools".

Specimens, models and displays, black board, bulletin board and chalk board, maps, globes, cartoons and free hand writing, magnetic mountings, and the writing table, photograph, audio aids and projections. Apart from these aids, there are a number of other aids that can be effectively used for the teaching of Physics.

The significance of Audio-Visual Aids in Teaching of Physical Science

"Good instruction" is the foundation of any educational programme and audio-visual aids help the teacher in importing such good instruction. Therefore the Physical science teacher must realize the importance of aids and should known their various types and should also be skilful to use them properly and meaningfully in teaching. He should be resourceful in the sense if some relevant aids are not readily available in school, he should prepare himself such material.

Once Descartes rightly said, "Nothing ought to be taught to children who could not be attested by eyes" Teachers are well aware of the value and importance of Aids and that they play effective role in instruction.

Teaching of Physical Science in Laboratory Settings

It is difficult to think of a science programme that does not lay more emphasis on practical than theory. In fact one of the major objectives of science teaching is the understanding of experimental method. Laboratory work develops out of other activities and in turn leads to certain forms of class work. Many activities in the laboratory, which are called experiments, are in fact exercises with laboratory equipment, which familiarize the students with certain apparatus and skills or demonstrate certain principles. The distinction between experiment and exercise lies in the information given to pupils. In experiment he does not know what the results would be. In an exercise even this telling should be avoided. A teacher should only provide materials and a set of suggestive directions. A well-

organized laboratory programme arises interests of students in the course and the science subject so much so that they select scientific vocations.

Laboratory can help students obtain and retain various sorts of knowledge. By making phenomena more vivid and memorable and by giving students practice in using vocabulary and concepts they can reinforce and build on material presented through lecture discussion and independent study. By showing students how data is obtained, analysed and interpreted. The students are helped to develop a sense of what science is about. Laboratories can aid students in acquiring a wide range of skills. Laboratory often is well suited for helping students develop higher mental skills, such as skills in problem solving, analysis, and critical thinking. Laboratories also offer opportunities to develop desirable attitudes in students.

An atmosphere of excitement, curiosity, interest and enthusiasm for science should be encouraged in the laboratory tempered by care and restraint in use of apparatus and techniques. Respect for the problem, the materials and the problem results of experimentation must be developed. The laboratory experience is nothing but one vehicle by which the objectives of science teaching are developed. Suitably carried out, it can be one of the most effective methods of teaching and learning.

Physical Science Room and Equipment

The evaluation in science teaching has necessitated changes in science room planning and designing. Science is not concerned with presenting facts but with the ways of thinking and acting. The lecture demonstration method is replaced by projection, the study of displays etc. the science room may be used for several of these type of activities going on the same time and should therefore be easily convertible into class room and laboratory space and seating should therefore provide this flexibility in a combined laboratory and lecture room.

No one person can do the job of planning, as it is a complex task involving consultations between administrators, members of education department, science specialists, science teacher and the architect. Laboratory classroom equipment and furniture manufactures with practical experience in designing and fitting modern science rooms should also be consulted for planning. After selecting site and location the first point to consider is the type of science room i.e. whether it is to be

a science room in which all sciences taught or specialized room for specific subjects. In considering the size of the room it may be ensured those thirty five to forty sq feet of space is to be available to each pupil and in addition ten to fifteen sq feet for larger projects and special activities. An ideal science room has an area in which pupils meet for recitations, demonstrations and other areas where they are directed for experiments and project work. Flexibility is provided by rearranging seats for discussion or group activity or larger projects. Special requirements of these modern rooms are good flooring preferably vinyl plastic, fireproofing, sound proofing and painting of walls and ceiling, good lighting and black out system, good heating and ventilation system. A combine classroom laboratory facilitates smooth transition from one activity to another.

An ideal laboratory should have the following equipment and fittings students tables equipped with acid resistance tops specially treated wood stone sink with water taps, waste pipes of lead, electric points standard and low voltage apparatus, storage space, gas supply (or spirit lamp) apparatus, support rods and sockets etc.

Fixed island table in the middle of room, peninsula tables round the walls of rooms, window shelters for displays and Physics related charts, small general purpose tables and teachers table for demonstration. Cupboards and drawers, well lighted black board with a side graph stand for projector, black out arrangements for the room, gas chamber, over, electro magnetically controlled chamber, letter file for clippings and pamphlets, cabinet for charts and maps bulletin board book shelves and wall racks for charts and maps and the first aid kit and fire extinguishers are the other necessary tools for a modern laboratory.

Delimitation of the Study

Keeping in view the scope of study and shortage of time and resources, the analysis is delimited to ten govt. High and higher secondary schools at Telangana State

Objectives of the Study

1. To find out the academic/ professional qualifications of the teachers who teach Physics at secondary level.

2. To find out the methods and techniques used by teachers in teaching of Physical science.
3. To find out whether there are any teaching aids, refresher courses and guide books for the teachers.
4. To find out whether the laboratories are well equipped to facilitate the teaching of Physical science.
5. To find out the suitability of the textbook of Physical Science.
6. To give suggestions / recommendations to make the teaching of Physical science effective.

Hypothesis

The curriculum and teaching of Physical science at secondary level is defective.

Background of the Study

Science at the secondary level has been introduced to provide a base for various scientific and technological disciplines that are considered important to the challenges of 21st century.

Physical science is a branch of science, which deals with the composition, properties of matter and the factors, which affect the matter.

The importance of Physical science has been increased to a very high degree due to its application in aspects of man's life. Man's own existence is a result of various processes if any vital process to function, his survival becomes difficult. Nuclear Physics provides us energy (atomic energy) which can be used in various fields for economic development. So the study of Physics is essential for the welfare of human beings.

Metallurgy, (Extraction of metals from ore) a chemical process, has revolutionized the whole economy of the world. The big complicated machines, which are the backbone of modern civilization, are the direct result of the present growth of Physics.

But our science education, at secondary level, is facing a number of problems. Shortage of facilities and trained teachers, ineffective in-service and pre-

service teaching programme sand theory based curriculum have made our science teaching, particularly the teaching of Physics ineffective.

Keeping in view the importance, scope and nature of Physical science it is needed to have modern scientific techniques to the teaching of this important subject.

In Physics teaching, the stress in put on the teacher based teaching which requires to be assisted by students based learning. The emphasis should be given to problem solving techniques, programme learning and laboratory teaching so as to flourish a scientific view of the learners of Physical science. In our schools, Physical science subject like other science courses is being taught as a theoretical subject. The dynamic aspect which is the real requirement of science is being ignored. Learning in laboratory setting has given less importance. Book recitation, lecture method, guide and notes culture has been adopted which does not empress creative attitude and problem solving capabilities in the learner. As a result students have turned to cheating and bad study habits.

Keeping in view the worst conditions of Physical science teaching, this research is conducted to find out the negative aspects and to give some recommendations for bringing improvement in the teaching of Physical science.

Importance of the Topic

Science education at secondary level has been introduced to enable the students to known about the chemical and biological processes and their mutual concern and the most important aim to promote scientific attitude and a spirit of inquiry among the learner. Physics being an important subject of science has been introduced with the same aim and objectives at the secondary level.

Dr. Mehmuda Rehman in her book “teaching of science and mathematics” has said from viewpoint of education one of the important values of Physics is to bring together the methods and result of a number of other sciences.

This unique nature of Physical science makes the teaching of the subject adventurous, interesting and a little bit hard as the teaching of this subject requires a

teacher to have all round knowledge of the science subjects and especially about the various teaching methods that one needed for other sciences.

The teaching of Physical science in itself is interesting and technical and requires some special skills and attitudes. The teaching of Physical science at the secondary level has got the following aims and objectives.

- To enable the students to understand the world of nature, Physical and biological processes and to integrate the natural phenomena.
- To introduce the work of Muslims scientists to the learner of Physics.
- To enable the students of Physics to be an active participant in solving problems of human society and existence.
- To develop an understanding of the basic needs provided by the nature.
- To maintain and improve the health of human beings and the whole community by the knowledge and skills of teaching Physics.
- The development a balanced personality through the teaching of Physics.

The Nature of Research

It is a descriptive research, which involves collecting data to test the hypothesis.

The population for the study consists of all the govt. high and higher secondary schools for boys and girls in Telangana state where the subject of Physical science is being taught.

Ten schools were selected from the population five schools from Municipal Corporation and cantonment board Peshawar and five from rural area of Telangana state.

Statistical Analysis

The data collected was tabulated and explained in percentages for the purpose of analysis. On the basis of inferred information findings were drawn and recommendations were suggested for the improvement of teaching Physical science at secondary level.

Instrument

To collect data a questionnaire was designed and administered to the teachers in the sample schools. All the teachers returned the questionnaire duly filled by them.

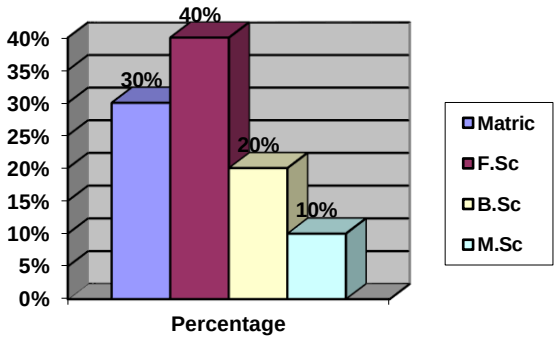
TABULATION AND ANALYSIS OF DATA

The researcher collected the data through valid questionnaire. The data is analyzed in tabular form as under. The teachers who teach Physical science, their views points are expressed in percentages. The description of every table and its analysis is preceded as under:

Table 4.1Academic Qualifications of Teachers, teaching the Subject of Physical science

Qualification	No. of Teachers	Percentage
Matric	3	30%
F.Sc	4	40%
B.Sc	2	20%
M.Sc	1	10%

Figure 4.1



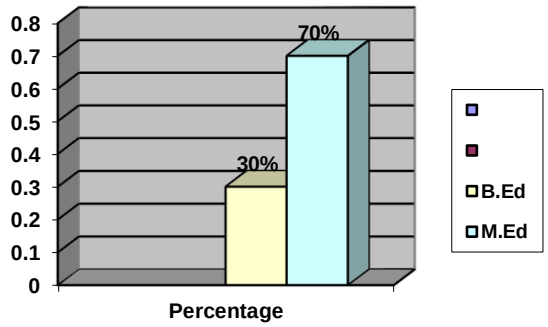
Analysis

The above table and figure show that 70% of the teacher teach physical science while 30% do not teach it.

Table 4.2 Professional Qualification of the Teacher

Qualification	No. of Teachers	Percentage
B.Ed	3	30%
M.Ed	7	70%

Figure 4.2



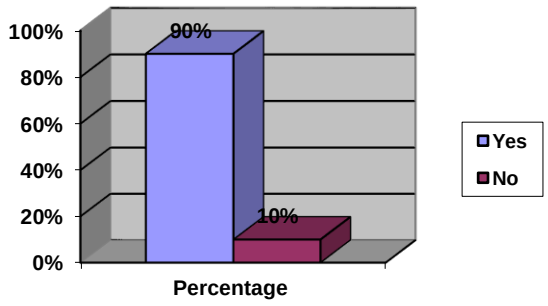
Analysis:

The table and figure represent that the teachers are highly competent professionally, because 70% teachers are M.Ed degree holders while 30% teachers are B.Ed degree holders.

Table 4.3 Teacher's Interest in Teaching Physics

No. of Teachers	Yes	Percentage	No	Percentage
10	9	90%	1	10%

Figure 4.3



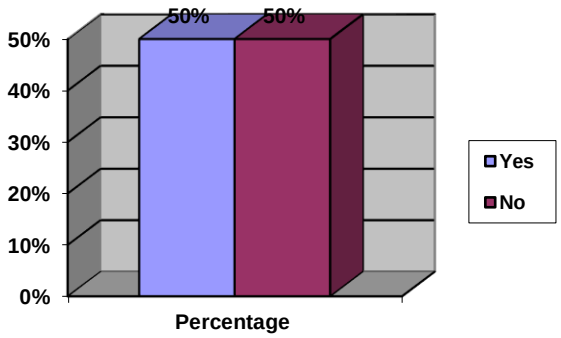
Analysis:

The table reveals that 90% teachers take interest in the teaching of Physical science, irrespective of the fact whether they are less qualified or high qualified. Only 10% teachers do not take interest as Physical science is a tough & difficult subject.

Table 4.4 Teachers Participation in Refresher Courses

No. of Teachers	Yes	Percentage	No	Percentage
10	5	50%	5	50%

Figure 4.4



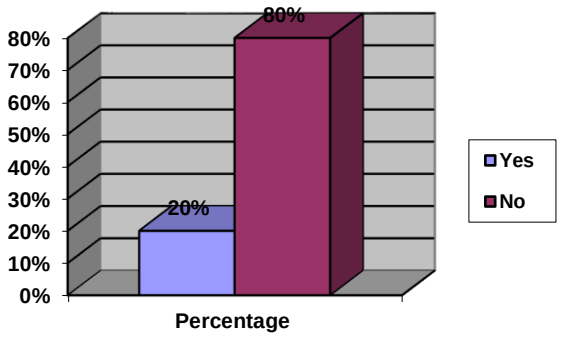
Analysis:

The table shows that half of the teachers have participated in refresh courses as 50% teachers have participated in refresher courses while half of the teachers have not participated, because 50% teachers do not participated in refresher courses.

Table 4.5 Teachers Special Training for Teaching of Physical science

No. of Teachers	Yes	Percentage	No	Percentage
10	2	20%	8	80%

Figure 4.5



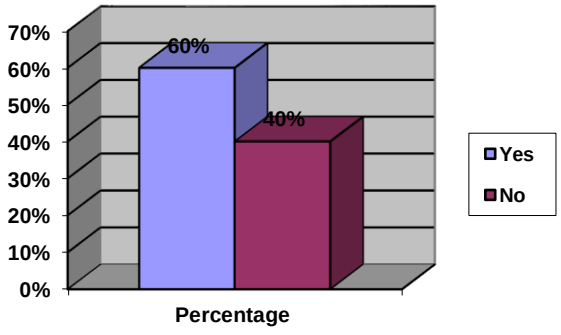
Analysis:

The table shows that only a small portion 20% of teachers have got special training for Physical science teaching, 80% teachers do not possess special training.

Table 4.6 Teachers Preparing Daily Lesson Plan

No. of Teachers	Yes	Percentage	No	Percentage
10	6	60%	4	40%

Figure 4.6



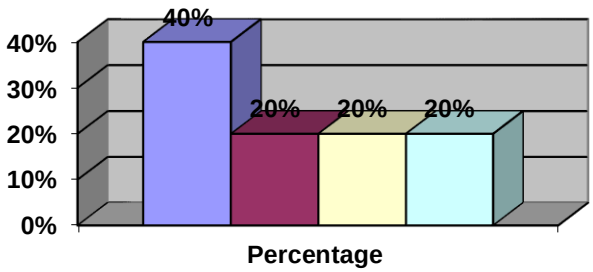
Analysis:

The table shows that 60% teachers prepare daily lesson plan for Physical science teaching while 40% teachers do not prepare their lesson plan.

Table 4.7 The Teaching Methods that are followed by Teachers during the Teaching of Physical science

Method	No. of Teachers	Percentage
Lecture method	4	40%
Book Recitation method	2	20%
Lecture Demonstration method	2	20%
Inductive Deductive method	2	20%

Figure 4.7



Analysis:

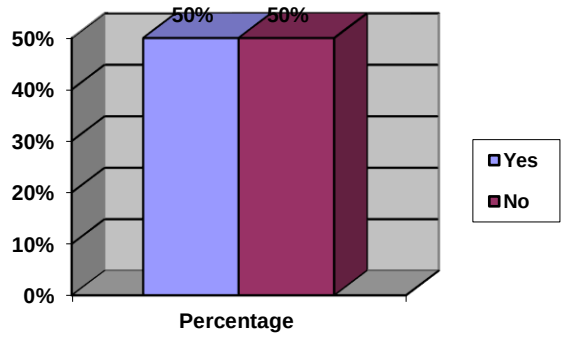
The table shows that 40% teachers use the centuries old out dated methods like lecture method, 20% teachers use book recitation method. It means that 60% teachers use the old method. Teachers who use lecture demonstration method are 20% while 20% teachers follow inductive Deductive method.

The table shows that the teachers play active role than the students, which is quite opposite to the recent trends in science teaching. Today, educationists are of the opinio9n that teachers must act like guides. Students should be kept busy during teaching learning procedures.

Table 4.8 Teachers Satisfaction from Teacher Training Institutions

No. of Teachers	Yes	Percentage	No	Percentage
10	5	50%	5	50%

Figure 4.8



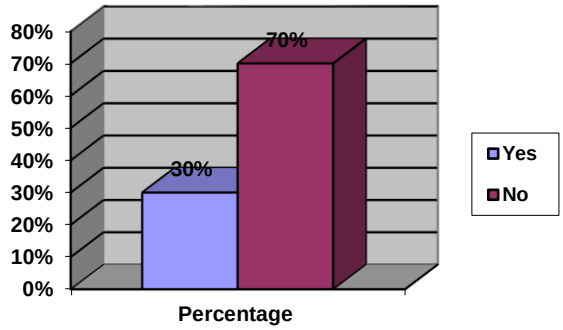
Analysis:

The table indicates that half of the Physical science teachers are satisfied with the performance of teachers training institutions, while half of them are not happy from their performance. The satisfied teachers are 50% while the unsatisfied teachers are also 50%.

Table 4.9 Availability of Resources that help in the Teaching of Physical science

No. of Teachers	Yes	Percentage	No	Percentage
10	3	30%	7	70%

Figure 4.9



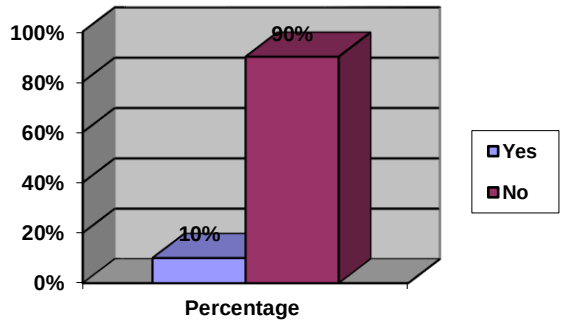
Analysis:

The table shows that there is shortage of helping resources, as 70% teachers say that schools lack helping resources, while just 30% teachers are satisfied with the available resources.

Table 4.10 Availability of Audio-Visual Aids for Teaching Physics

No. of Teachers	Yes	Percentage	No	Percentage
10	1	10%	9	90%

Figure 4.10



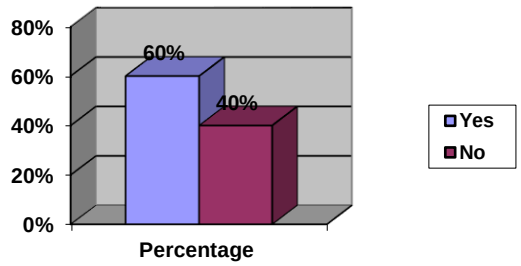
Analysis:

The table shows that 90% teachers say that audio-visual aids are not available while just 10% teachers are happy with their availability. It means that there is an acute shortage of audio-visual aids in schools.

Table 4.11 Use age of Audio-Visual Aids

No. of Teachers	Yes	Percentage	No	Percentage
10	6	60%	4	40%

Figure 4.11



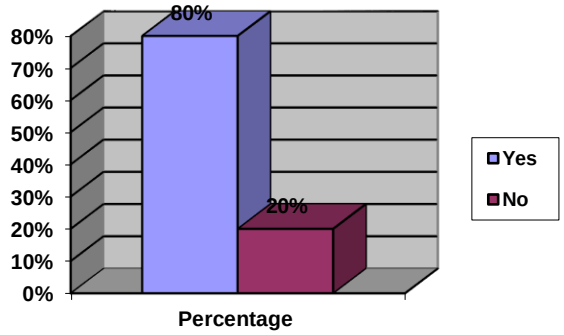
Analysis:

The table shows that a huge percentage of teachers use audio-visual aids in their teaching, findings from the table indicate that 60% teachers use audio-visual aids while 40% teachers do not use them at all. This high percentage indicates teacher's interest in using audio-visual aids, with the fact that most schools do not have these audio-visual aids.

Table 4.12 Teachers Suffer from Excessive Teaching

No. of Teachers	Yes	Percentage	No	Percentage
10	8	80%	2	20%

Figure 4.12



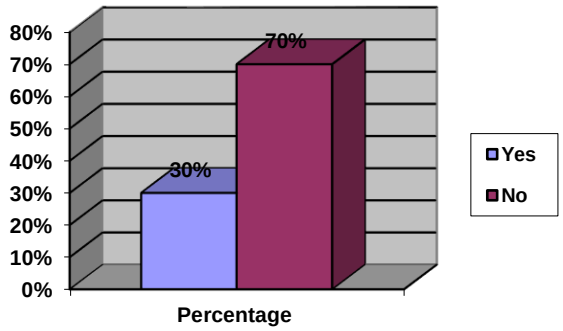
Analysis

The table indicates that the teachers of Physical science have been over loaded with excessive teaching; the table shows that 80% teachers are suffered from excessive teaching while only 20% teachers are satisfied from their teaching load.

Table 4.13 Responsibility of Over Crowded Classes for the Bad Performance of Physical science Teachers

No. of Teachers	Yes	Percentage	No	Percentage
10	7	70%	3	30%

Figure 4.13



Analysis

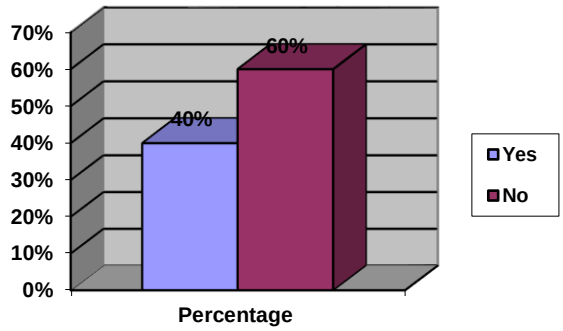
The table reveals that 70% teachers believe that overcrowded class are responsible for bad performance. While 30% teachers say that are crowded classes, is not a major cause of decline in the teaching of Physical science.

The research aggress that overcrowded classes is one of the hurdles in teachers performance, but still then are also other crucial factors that equally lower the performance of teachers. It is a fact that the teacher's bad performance is the result of all other causes collectively. But it is also a fact that overcrowded classes is one of the major reasons of teacher performance.

Table 4.14 Teacher's Satisfaction with their Salaries and Facilities

No. of Teachers	Yes	Percentage	No	Percentage
10	4	40%	6	60%

Figure 4.14



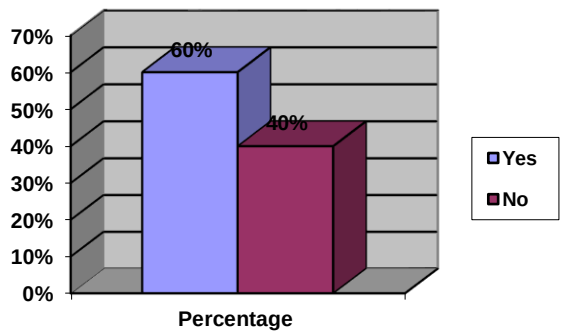
Analysis

The table indicates that only 40% teachers are satisfied with their salaries and facilities while a huge percentage of 60% is not happy salaries and faculties that are provided by the govt.

Table 4.15 Teacher's Assessment of Student's Performance

No. of Teachers	Yes	Percentage	No	Percentage
10	6	60%	4	40%

Figure 4.15



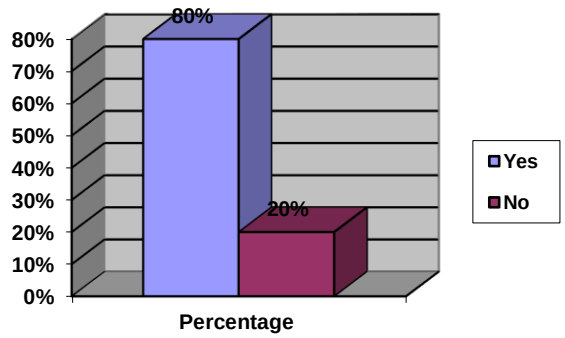
Analysis

The table shows that 60% teachers assess the students performance in their Physics class while 40% teachers admit that they do not assess student's performance in the their class.

Table 4.16 Responsibility of Physics Paper in Annual Examination for Bad Performance

No.of Teachers	Yes	Percentage	No	Percentage
10	8	80%	2	20%

Figure 4.16



Analysis

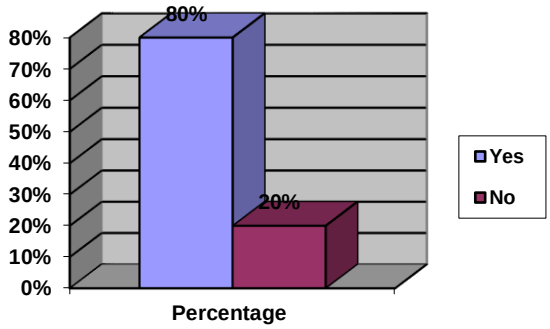
The table indicates that 80% teachers believe that improper setting of Physical science paper is one of the major causes of bad performance. 20% teachers mention that paper setting is not a factor for bad performance of Physical science teachers.

The Physical science examination paper mostly concern with essay type questions that only evaluate student's power of memorization. The students performance is judged on the basis of theory while the practical aspect while is essential for any science, is almost ignored.

Table 4.17 Improvement in the Examination of the Subject of Physical science

No. of Teachers	Yes	Percentage	No	Percentage
10	8	80%	2	20%

Figure 4.17



Analysis

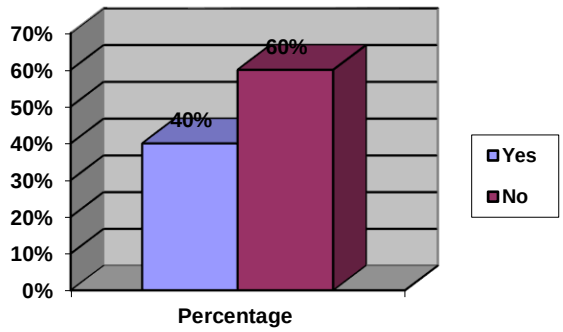
The table shows that 80% teachers are of the opinion that the procedure of evaluation in Physics should be changed while the remaining 20% teachers support the present system of evaluation.

This high percentage of teachers, which is against the system of evaluation, show high protest against the examination system.

Table 4.18 Aim of Teaching Whether to help Students to Pass Exam or to Impart Knowledge

No. of Teachers	Yes	Percentage	No	Percentage
10	4	40%	6	60%

Figure 4.18



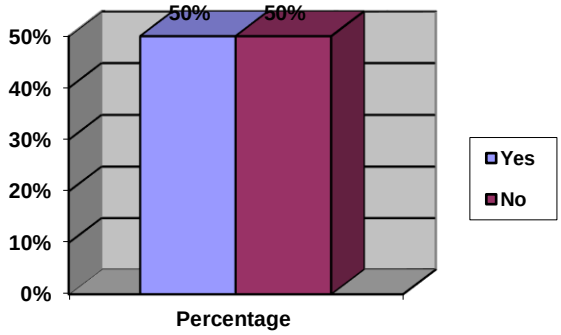
Analysis

The tables show that 60% teachers are interested to impart knowledge while 40% teachers confirm that they help student just to pass examination.

Table 4.19 Compatibility of the Content of Physical science According to the Mental Level of Students

No. of Teachers	Yes	Percentage	No	Percentage
10	5	50%	5	50%

Figure 4.19



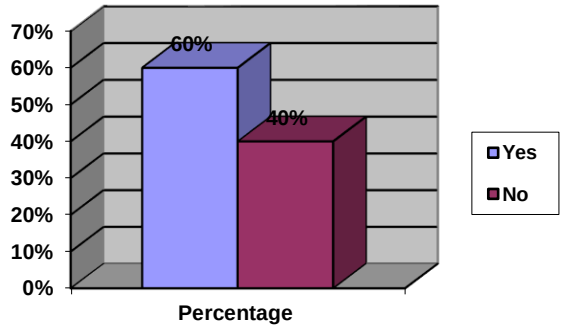
Analysis

The table indicates a very interesting scenario that 50% teachers say that the content of Physics is not according to the mental level of students, while 50% teachers believe that its content is in accordance with mental level of students.

Table 4.20 Compatibility of the Content of Physical science with the Present Day Needs of Students

No. of Teachers	Yes	Percentage	No	Percentage
10	6	60%	4	40%

Figure 4.20



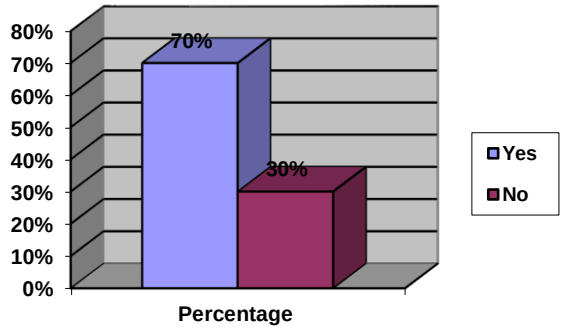
Analysis

The table shows that 60% teachers think that the content of Physical science is according to the present day needs of our students, while 40% teachers say that they do not see any compatibility between its content and the needs of students.

Table 21 Improvement in the Curriculum of Physics

No. of Teachers	Yes	Percentage	No	Percentage
10	7	70%	3	30%

Figure 4.21



Analysis

The table shows that 70% teachers like improvement in Physical science curriculum, while 30% teachers are against of such change.

FINDINGS, CONCLUSION & RECOMMENDATIONS

Findings

Following are the major findings based on the analysis of the data recorded in the previous chapter.

1. Only 30% teachers have the required academic qualification in the subject of Physical science.

2. 100% teachers are professionally qualified.

3. 50% participate in refresher courses.

4. Just 20% teachers have got special training in Physical science teaching.

5. 60% teachers prepare daily lesson plans.

6. 60% teachers use the old and outdated methods like lecture method and book recitation method.

7. 50% are satisfied from teacher's training institutions.

8. 70% teachers complained against the non-availability of helping resources that help in the teaching of Physical science.

9. According to 90% teachers audio-visual aids are not available in schools.

10. 60% teachers use audio-visual aids in their Physical science teaching.

11. 80% teachers are over loaded with excessive teaching.

12. 70% teachers express that overcrowded classes are responsible for their bad performance.

13. 40% teachers are not satisfied from their salaries and facilities.

14. 60% teachers assess students' performance in their Physical science class.

15. 80% teachers believe that setting of Physical science paper is responsible for the bad performance.

16. 80% teachers favour improvement in the Examination pattern of Physical science subject.

17. 40% teachers say that the content of Physical science is not according to the mental level of students.

18. 50% teachers of the opinion that content of Physical science is according to present day needs of students.

19. 60% teachers believe that the curriculum of Physical science subject needs improvement.

20. 70% unqualified (academically) teachers teach the subject of Physical science.

Conclusion

The research has arrived at the following conclusions at the end of the current study.

1. Almost all the teachers, teaching the subject of Physical science, are professionally qualified, but majority of them lack the required academic qualifications.

2. Only a small friction of teacher has got special training in Physical science teaching.

3. More than half of the teachers reseat to old and outdated teaching methods like lecture method and book recitation method. If shows that teachers give importance to the theoretical aspect of science while the practical aspect which is the real essence of science is totally neglected.

4. To develop scientific attitude among the students is almost neglected. Because the teachers of Physics and students are forced to go to the theoretical aspect of Physical science as a Physical science students performance is judged on the basic of how much course content he has learned. Practical evaluation in this subject is mere a joke, because only 25% masks is assigned to this important part of evaluation.

5. In the subject of Physical science, the teaching learning process under ways in the old fashioned class rooms. The so called science laboratories have been built separately from the class rooms.

6. The so called science laboratories are faced with acute shortage of equipments and resources.

7. Majority of teacher's complaint against the non-availability of teacher resources, that helps in the teaching of Physical science.

8. The curriculum of Physical science subject badly affect the teaching learning process, as it emphasis only the theoretical aspect (product) of science, because a student performance is judged on the memorization of theory. Practical work is given little importance and thus knowledge, understanding, comprehension etc. are ignored. We cannot think of any science programme without practical work, which develops scientific attitude and other skills that are the intended outcome of any science programme. This curriculum creates bad study habits in students like cramming, selective study, and also promotes cheating. The Physical science curriculum also affected the performance of good Physical science teachers, because they teach only the important parts in the contents that might be necessary from examination point of view. The statistics shows that the content of Physical science is not according to the mental level of students. It also lacks compatibility with the present day needs of our student and society. Therefore 80% teachers are not satisfied and favour immediate changes and innovations in the curriculum of Physical science subject.

9. Evaluation procedures of Physical science subject are highly defective and require quick remedial measures in this regard. Beside shortage of examination halls, proper temperature, right, ventilation and trained examiner etc. the paper setting of Physical science paper is one of the major causes of disturbance. In the evaluation of Physical science subject, a student performance is judged on the basis of his memory power. The paper consists of a large number of essay questions and students are free to opt out of a large number of questions. These questions are usually open ended and no limit is put on students, responses. A small number of objective type questions of about 25% weight age are included in the paper.

This pattern has marred the entire teaching learning procedure of Physical science subject because students resort to cheating, selective study and rote memory. The teachers also teach those parts of the course which are important from examination point of view.

Thus the aims of Physical science subject are totally neglected. The student's evaluation is conducted once at the end of session. Teacher's focus on the acquisition of Physical science knowledge only ignore other important ends like comprehension, application, analysis, synthesis and evaluation & more importantly the scientific attitude which is the real goal of teaching any science programme.

Physical science teachers cannot give due importance to these essential goals because of annual examination which only requires the knowledge aspect of Physical science subject from the students.

10. The schools do not possess the helping resource guide books & modern literatures that could help teachers in improving their teaching in the subject of Physical science.

11. The schools are faced with acute shortage of Audio-visual Aids. The use of Audio visual aids is necessary for any educational programme but for a science programme like Physical science, it is imperative, because it makes the teaching clear and comprehensive.

12. Almost all the teachers are overloaded with excessive teaching.

13. Over crowded classes also participate in the deteriorating condition of Physical science teaching.

14. Teachers of Physical science are unsatisfied from their salaries and facilities.

15. Today's teachers of Physical science subject are not sufficiently trained and thus the performance of teachers training institutions is not good.

Recommendations

Following recommendations are made to improve the teaching of Physical science at secondary level.

1. Teachers, teaching the subject of Physical science must have the required minimum academic qualification (B.Sc) in Physical science subject along with the required professional qualification (B.Ed, M.Ed).

2. It is imperative to revise the curriculum of teacher education and especially the science education with particular emphasis on Physical science teaching. It is a well-

known fact that pre-service and in service teacher training programmes have not come up to the challenges of modern world. Being equipped 3 with innovative approaches, the teachers of Physical science will not tell their students about science (Physics) but they will provide those opportunities to practice it. They will enable students to practice science in a manner, together facts, generalize, speculate, check and criticize the results themselves. The teachers will modern students into various activities which will enable them to make their own observation, experimentation and come to their own conclusion.

Therefore the curriculum of a training programme in science education would be more activity oriented rather than subject cantered Emphasis is to be given to use the innovative methods such as programmed learning, microteaching, individualized and group experimentation, discussion, team teaching, project method and inquiry approach. The role of a Physics teacher should be of a collaborator and team leader, he has to guide the student's activities.

Teachers of Physical science have to realize that text book and laboratories are not the only sources of scientific knowledge but the whole inurnment is to be used for the students learning. Taking in view the dynamic nature of teaching of Physical science, the existing training programme need to be reoriented and revitalized.

3. The curriculum of Physical science subject at secondary level needs quick and immediate changes as that it should be made compatible with the trends in science education, which emphasis the practical aspect considerably on the part of students.

Our present curriculum of Physical science at secondary level is not suitable to be taught through the modern methods of teaching like programme learning, project method, team leaching, teaching in laboratory setting.

The content of Physical science subject is not according to the present needs of students and society. It also lacks compatibility with the mental level of students.

4. Efforts should be made to provide all the teaching aids like audio-visual aids and well equipped laboratories and the science literature concerning the course.

5. The old fashioned separate class room and separate science laboratory must be replaced with a single science room that must have facilities for reading and

practical purposes. For the constriction of these science rooms, modern techniques and up to date knowledge should be considered seriously.

6. Helping aids like guide books and science recourse centres etc could be provided for the teachers of Physical science.

7. The proposition of Physical science teachers and students should be balanced by increasing the number of Physics teachers. For the Physical science teachers, it should be made compulsory that they must have at least B.Sc academic qualification in Physical science subject along with the required professional qualification B.Ed or M.Ed.

8. A handsome package of salaries and facilities should be provided to the science teachers and most especially to the teachers of Physical science.

9. Sufficient number of audio-visual aids should be provided to the school. Physical science teachers should be specially trained to use, prepare and maintain these audio visual aids, for the subject of Physical science.

10. The Govt. should initiate special training and refresher courses on modern lines, for teaching the subject of Physical science. Strict measures must be taken to ensure the compulsory participation of all the teachers.

11. To avoid overcrowding of students in single class, sufficient number of modern science rooms should be built in each school.

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