

The School Science Laboratory : Its Availability and Utilization in the Secondary Schools of Kohima Town (Nagaland)

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Abstract

Scientific literacy has become an educational necessity for survival of human beings in today's fast advancing, gadget-filled, technology-based society. Scientific literacy includes a firm understanding of the concepts, principles and the processes of Science and its application to solve daily life problems. Being educated in Science enables an individual to make wise decisions about health, nutrition, medication, use of energy and the protection of the environment. Unless one has the basic scientific knowledge, it will be difficult to adjust him or herself to the fast changing environment. Therefore, to match with today's world, a substantial amount of scientific knowledge and skill is required by all. Ignorance of the basic concepts in Science cuts off an individual from understanding the manifold benefits brought by Science, and surely, is, at a disadvantage in the modern world. Science affects the common people and plays a dominating role in a person's life. Therefore, learning of Science must reach the masses. In schools, to prepare the learners in the much needed critical thinking and problem solving skills, learning of Science should be made experiential. Schools are also expected to prepare the learners of secondary stage for higher studies and Science related careers. However, it is observed that in many schools, Science is being transacted using only theoretical methods. It is therefore, a concern that, schools are provided with well equipped Science laboratories so as to facilitate development of numerous scientific skills in the learners. This work is aimed at finding out the availability and utilization of Science laboratory for teaching Science, in the secondary schools in Kohima Town, Nagaland.

KEYWORDS: Availability, Utilization, Science Laboratory, Secondary School

INTRODUCTION

Science is one of the most exciting human experiences. It unfolds the wonders of nature and helps people to understand the various patterns and interrelatedness of things in the environment. The study of Science makes a person well informed about the new ways of life and makes him/her independent, productive and self-reliant through application of scientific knowledge in various fields. Further, the nature of Science is such that, it develops in its learner creativity, open-mindedness, critical thinking, truthfulness and appreciation of nature.

To achieve these values, the teaching learning of Science needs to be practical and activity oriented. It is, however unfortunate that, schools fail to provide such opportunities to the learners. The secondary stage is a crucial stage in the educational ladder, as it prepares the learners for higher studies and the world of work. However, many learners graduate the course without acquiring the necessary scientific knowledge and skills which are expected of them at this stage. It is, therefore, imperative that, teaching learning of Science is grounded on hands on experiences and filled with awe and excitement. Teaching of Science at the secondary stage requires facilities such as a Science laboratory, which is central to any Science teaching, sufficient number equipments and materials and a large number of visual materials, besides a cadre of well qualified and professionally trained teachers, to offer rich experiences to the learners. The Nagaland Board of School Education (NBSE) Science Curriculum for the Secondary level demands each learner to perform 10 practical experiments, having them drawn from Physics, Chemistry and Biology areas of Science. This is internally assessed by the respective schools and the scores submitted for the partial fulfillment of the secondary course. However, many schools fail to conduct meaningful activities in Science, due to lack of Science laboratory in their schools. While many policies stress on the need of improving Science education in school, it is unfortunate that, they are still ill-equipped for teaching Science.

STATEMENT OF THE PROBLEM

The problem for the study is entitled as “**The School Science Laboratory: its Availability and Utilization in the Secondary Schools of Kohima Town**”.

OBJECTIVES OF THE STUDY

1. To find out whether or not there is a Science laboratory available in the school.
2. To find out whether or not the Science laboratory materials and equipments are sufficient for conducting practical in Science.
3. To find out the academic and professional background of teachers in the secondary schools.
4. To find out the number pupils handled and classes taken by Science teachers in the secondary schools.
5. To study the problems related to scientific knowledge and competency of Science teachers in the use of Science laboratory.

METHODOLOGY

The descriptive survey design is used to study the problem “The School Science Laboratory: its Availability and Utilization in the Secondary Schools of Kohima Town”.

POPULATION AND SAMPLE

The population for the study is, the secondary schools of Kohima town, its Science teachers and the students of secondary stage (classes IX and X). The sample for the study is 20 (60%) secondary schools; 4(four) government and 16 private, and the entire population of Science teachers and students of the schools.

Tools and Techniques used for Data Collection

The tools that could be used in the descriptive type of study were reviewed and studied. Subsequently, Questionnaire, Checklist and Interview Schedule were identified.

Questionnaire

To collect information from the Science teachers for the study, the investigators constructed the questionnaire keeping in view the objectives of the study. The draft questionnaire containing 25 questions was then pilot- tested with 10 (ten) teachers of 6 (six) secondary schools and 2 (two) experts in the field of education to invite criticism and establish its face and content validity. It was then finalized with 21 items.

Checklist

The Checklist was constructed and used to find out the number of different Equipments, Chemicals and Materials available for conduct of practical in the schools' Science laboratory. It had all the required Science items listed, based on the practical experiments specified by the NBSE in its curriculum for secondary level. A total of 24 items in Physics, 36 in Chemistry and a total of 12 Science items in Biology were listed in the checklist.

Interview Schedule

To collect information from the students of classes IX and X on conduct of practical classes in Science, the interview schedule was identified. It was the unstructured type containing 5 (five) specific questions relating to conduct of practical classes.

PROCEDURE FOR DATA COLLECTION

The questionnaire which was constructed, pilot-tested and finalized was delivered to the respondents personally by the investigators. There were in total, 46 teachers in the sampled schools. However, only 40 answered questionnaires could be collected.

A senior teacher in each of the sampled school was requested and given the responsibility to check the equipments available in their school Science laboratory. The duly marked Checklist could be collected from all the 20 schools.

The Interview schedule was used by the investigators themselves. The interview was based on the conduct of practical classes.

PROCEDURE FOR DATA ANALYSIS

The collected filled-in Questionnaires were scrutinized to check their acceptability and categorized under different pre determined categories. For the analysis of the open-ended questions, a scoring key was used, and in the case of closed ended items, tabulation sheets, using tally marks were used.

The analysis of the data collected through the Checklist was done applying arithmetic operations of addition and percentage. For reasons of interpretation and easy understanding, the fractions, while finding out percentage in the figures have been rounded off following the conventional mathematical formula.

ANALYSIS OF DATA

TABLE 1: Background of Science Teachers of Secondary Schools in Kohima Town

Variable	Sub- Variable	No. of Teachers (%)
Gender	Male	21 (53)
	Female	19 (47)
Academic Qualification	B. Sc.	39 (98)
	B. Com	1 (2)
	M. Sc.	17 (43)
Professional Qualification	Trained	4 (10)
	Untrained	36 (90)
Nature of Appointment	Regular	26 (65)
	Ad hoc	5 (13)
	Contract	9 (23)
Participation in Short-Term Professional Courses	Attended	5 (13)
	Not Attended	35 (87)

It is evident from the table that there were more male teachers than those of female gender which was 21 and 19 respectively. All the Science teachers were found academically qualified with a B. Sc. Degree except one (1) who had a B. Com. Degree, while seventeen teachers had a higher M. Sc. Degree. An impressive 90 per cent of teachers were found untrained, while only 10 per cent were trained. Sixty five per cent of the teachers were regular appointees, 23 per cent contract and 13 per cent were on ad hoc basis. A high majority 87 per cent had not attended any Short-term courses, while 13 had attended such courses.

TABLE 2: Number of Pupils handled and Classes Taken by Teachers in a Day

Class	No. of Pupils	No. of Teachers	No. of Classes taken by Teachers Per Day	No. of Teachers
Secondary level (Classes IX and X)	<40	14 (35%)	1-3 classes	16 (40%)
	>40	26 (65%)	4-6 classes	24 (60%)
Total		40 (100%)		

Of the 40 teachers, 35 per cent handled less than 40 pupils in a class, while 65 per cent handled more than 40 pupils in a single classroom. A total of 16 (40%) teachers took 1-3 classes per day, while for 24 teachers; it was 4-6 classes in a day.

TABLE 3: Presence or Absence of Science Laboratory and Conduct of Practical Classes

Variables	No. of Schools	
	Yes %	No %
Presence of a Science laboratory	13 (65)	7 (35)
	No. of Teachers	
Conduct of Practical Classes in Science	12 (30)	28 (70)

Science laboratory was present in 13 (65%) of the schools. However, in 7 (35%) schools it was found absent. As regards conduct of practical classes in Science, 70 per cent did not conduct, while only 30 per cent conducted practical classes in Science.

TABLE 4: Reasons for Non-conduct of Practical Classes in Science

Reasons	No. of Teachers	%
Infrastructural Problem	8	29
Insufficient Equipments and Materials	12	43
Large Number of Pupils	4	14
Insufficient Time for Preparation	4	14
Total	28	100

From the table, it is clear that, 43 per cent of the teachers did not conduct practical due to insufficient equipments and materials in Science, followed by 29 per cent due to infrastructural problem, while for 14 per cent, it was due to large number of pupils. An equal 14 per cent reported it was due to insufficient time for preparation.

TABLE 5: Availability and Sufficiency of Materials, Chemicals and Equipments

Areas of Science	Sufficiency of Science Materials		Total
	Sufficient %	Insufficient %	
Chemistry	6 (30)	14 (70)	20
Physics	7 (35)	13 (65)	20
Biology	6 (30)	14 (70)	20

Of the 20 schools under study, 70 per cent did not have sufficient materials in Chemistry, only 30 per cent of the schools had sufficient equipments. In the area of Physics, it was insufficient in 65 per cent of the schools, while only 35 per cent had sufficient items. In Biology, practical items were insufficient in 70 per cent of the schools, while it was sufficient in 30 per cent.

TABLE 6: Distribution of Schools by Status of Science Laboratory

Status of Science Laboratory	No. of Schools	Percentage
No Laboratory	7	35
Fairly equipped	5	25
Satisfactorily Equipped	5	25
Well Equipped	3	15
Total	20	100

Considering the overall availability of items in all the three major components of Science, on an average, 35 per cent of the schools were categorized under 'No Laboratory' status, 25 per cent 'Fairly equipped', another 25 per cent 'Satisfactorily equipped' and only 15 per cent of the schools were categorized under 'Well equipped' laboratory status.

TABLE 7: Distribution of Science Teachers by their Willingness to Upgrade Knowledge in Practical Skills in Science

Teachers Willingness		Areas needing Up gradation in Practical skills		
Yes	No	Chemistry	Physics	Biology
34 (85%)	6 (15%)	28 (70%)	24 (60%)	11 (28%)

It is evident from the table that 85 per cent of the teachers wanted up gradation in practical skills in Science. Only 15 per cent did not require it. Of the 40 teachers, 70 per cent in Chemistry practical skill, 60 per cent in Physics and another 28 per cent wanted up gradation in Biology component of Science. The table further shows that, a few teachers wanted practical knowledge up gradation in more than one area of Science.

TEACHERS' SUGGESTIONS FOR IMPROVEMENT IN UTILIZATION OF SCIENCE LABORATORY

1. Appointment of a Science Laboratory helper.
2. Collection of a minimal Laboratory Fee from the Pupils.
3. Involvement of Science Teachers in Procuring Science Laboratory Materials.
4. Allocation of Practical Periods in the School's Daily Routine.
5. Establishment of Separate Laboratories for Chemistry, Physics and Biology.
6. Use of Locally available Materials.

FINDINGS OF THE STUDY

The findings that emerged out of the analysis of data are as follows:

1. All the Science teachers except one, who had a B. Com Degree, were academically qualified with a B. Sc. Degree. It was encouraging to find out that 43 per cent had a higher M. Ed. Degree.
2. It was disheartening to find out that, 90 per cent of the teachers were professionally *not* qualified. Only 10 per cent were found to be professionally qualified.
3. Sixty five per cent of the teachers were regular appointees.
4. Of the 40 teachers, 87 per cent had *not* attended any Short- term professional courses.
5. Sixty five per cent of the teachers were found handling more than 40 pupils in a class.
6. It was encouraging to find that 65 per cent of the schools had Science laboratory. However, upon enquiry on whether or not the practical classes were conducted, it was disheartening to find that 70 per cent of the teachers did not conduct practical classes in Science, while 30 per cent had conducted.
7. Of the 70 per cent who did not conduct practical, 'insufficient equipments and materials' was the reason for 43 per cent, 'Infrastructural problem' for 29 per cent, 'large number of pupils' for 14 per cent, and it was due to insufficient time for preparation' for another 14 per cent.
8. In all the three major areas of Science, materials were insufficient for conduct of practical classes.
9. The status of Science laboratory in the secondary schools is discouraging. Thirty five per cent of the schools were categorized under 'No Laboratory', 25 per cent 'Fairly Equipped, another 25 per cent 'Satisfactorily Equipped" and only 15 per cent of the schools were categorized under 'Well Equipped status.
10. It appeared that many Science teachers were *not* confident in the conduct of practical. It is evident from the findings, as 85 per cent wanted up gradation in Science practical skills. Of which, 70 per cent wanted in Chemistry, 60 per cent in Physics and 28 per cent wanted practical skill up gradation in Biology.
11. While admitting their inability in the conduct of practical, Science teachers recommended appointment of a laboratory helper; collection of laboratory fees from pupils; involvement of Science teachers in procuring Science laboratory materials; allocation of Science practical periods in the school's daily routine and setting up of separate laboratories for Chemistry, Physics and Biology.

RECOMMENDATIONS

Keeping in view the findings of the study, the following suggestions have been made:

1. It is encouraged that Science teachers may use practical methods for teaching Science to make it exciting and enjoyable to the learners.
2. To acquire proficiency, spontaneity and accuracy in the use of practical skills, Science teachers need to undergo short-term training courses at good intervals.

3. As suggested by the teachers, to aid the teacher in preparation and arrangement of laboratory, appointment of a laboratory helper may be considered.
4. Reflect practical periods in the school's daily routine for effective planning on the part of the teacher for conduct of practical.
5. The workload of the teachers and teacher-pupil ratio needs to be balanced to enable them to plan, prepare and conduct practical classes in Science.
6. Consulting and involving Science teachers while procuring Science equipments may be considered to maintain a balance in all the different areas of Science.
7. The 'directives' in the practical syllabi for secondary level given by the board for conduct of practical needs to be reviewed.
8. The management is encouraged to make an effort to revive Science laboratories to make Science teaching meaningful and experiential to the pupils.

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