THE AVAILABILITY AND USE OF SCIENCE LABORATORIES AT SECONDARY EDUCATION LEVEL

By

T.J.M.S. RAJU * N.V.S. SURYANARAYANA **

* Principal, KPN College of Education, Gantyada, Vizianagaram.
** Teaching Associate, Andhra University, Campus, Vizianagaram, Andhra Pradesh, India.

ABSTRACT

This study focuses on the availability and use of Science Laboratories at the secondary education level in Visakhapatnam District of Andhra Pradesh, India. It is commented that most of the schools do not possess well equipped laboratories and even when equipment is available some science teachers are not utilizing the laboratory facilities. Another issue is many of the laboratories do not possess appropriate equipment and many schools use expired chemicals that can skew experiments as well as be hazardous to students and teachers.

The data were collected from 50 science teachers working in both government and private management secondary schools by way of a statement questionnaire. The items denoting various facilities in the science laboratories and the availability of equipment and utility by the science teachers are more important. The tool is a self developed tool and was standardized by conducting item analyses using the statistical procedures of chi-square tests. The reliability of the test is 0.75 and the validity is 0.86. So the tool is highly reliable and valid.

The data were analyzed by way of means, standard deviations, t-values and chi-square tests for testing the various hypotheses framed. The results declare that there are no significant differences between male and female science teachers, rural and urban science teachers, below 5yrs and above 5yrs experienced science teachers and graduate and post graduate science teachers in the availability and effective use of science laboratories at secondary schools, demerits of science laboratories and measures taken for effective use of science laboratories. On over all observation of the study some educational implications were given.

Keywords: Secondary Education, Laboratories, Teachers.

INTRODUCTION

Science has occupied an important position in secondary education level. The secondary schools have to maintain with well equipped laboratories. This felt that only chiller and talk methods makes science on understanding subject more over with theory only students are like frogs in a well totally unaware of understanding subject more over with theory only and totally unaware of experimental techniques. Experimental study is very essential and facts become everlasting if pupils perform experiments themselves instead of memorizing like parrots. If good teachers are there first teaching and laboratory is the second most important requirement.

Science is the subject, which requires practical observation and experimentation in the laboratory. The teaching of science cannot be more effective without the practical application for this laboratory is very essential in the schools. In addition to this science laboratory also play a vital role in the achievement of science. But nowadays only some schools possess laboratories more over science is not a single unit. It is divided in to various branches as Botany, Zoology, Physics and Chemistry etc. Today specialization in one or other branches of science has been realized for the scientific improvement. The needs and interest of pupils in the field of science are also diversified. So proper laboratory facilities to all the above branches of science not only elevate the progress of pupils to learn the subject but also the teachers efficiency of instruction as there is an imperative need for the present investigation.

Review Studies

Some relevant studies previously done on these issues were mentioned in this section. Patel (1990) found that thirty schools have no facilities for teaching of the Physics and Chemistry. Only 66% of schools had necessary equipment for the teaching of physics, chemistry in SSC 60% of schools fall below the prescribed standard for their dimensions of laboratory. 65% of the schools were not in a position to provide ideal condition of the area of the laboratory tables. 27% of the schools didn't give more than 10 demonstration practical in each stand.

Rao (1990) surveyed sciences laboratories in the states of Maharastra and Rajasthan where as the overall situation in this regard is quite favorable both in rural and urban schools in both the states. It is only in Rajasthan that the majority of the students perform their experiments individually. Further it is only this state that government schools that have facilities for improving and repairing scientific equipment in Maharastra.

Anantha Lakshmi (1994) concluded that all the teachers irrespective of urban and rural differences expressed opinion on the importance of science laboratory both men and women teachers expressed identical opinions on the role of the laboratory. Teachers belonging to different managements like government and zilla parishad expressed identical on the importance of science laboratories. Most of the laboratories functioning in our secondary schools do not possessed the minimum facilities required for them. The physical facilities enjoyed by the science laboratories are inadequate and insufficient. Most of the schools maintained by zillaparishad when compared with the other managements the material like microscope, vivarium, audio-visual equipment and aquarium are absences in many of the science laboratories.

Ranga Reddy (1994) found that measurement instruments play an important part in the teaching of science in secondary schools but the equipment relating to this sphere is in adequate in the secondary schools. The supply of chemicals is not up to the mark. Zoological samples are ill equipped in the schools. There is no adequate number of visual aids in schools.

Adinarayana (1998) found that there is no significant difference in the opinions expressed by urban and rural teachers on the characteristics of science laboratories. Both men and women teachers without any difference in their professional status like undergraduate and post graduate teachers has no significant difference in their opinions of the characteristics of science laboratories. The teachers working in different managements namely governments and private schools expressed similar opinions on the characteristics of science laboratories at secondary school level.

Rajput et al (1978) found that in Madhya Pradesh 68.75% schools did not have any arrangements for water supply in laboratories. 91.4% schools have no gas supply. 28.57% schools have no electrical fittings. 77.14% did not have botanical garden and 88.57% did not have any workshop for undertaking minor repairs. Surprisingly 10% of schools did not have any laboratory.

Problem

The problem selected for the present study is the availability and use of science laboratories at secondary education level in Visakhapatnam district of Andhra Pradesh, India.

Variables

The variables like gender (male and female), locality (Rural and Urban), experience (Below 5 yrs and above 5 yrs) and academic qualifications (graduation and post-graduation) are adopted for this study. The dimensions of dependent variables are the availability and effective use of science laboratories at secondary schools, limitations of science laboratories and effective use of science laboratories at schools.

Objectives

- To study the availability and effective use of science laboratories at secondary schools.
- To study about the demerits of science laboratories at schools.
- To study about the measures taken for effective use of science laboratories at schools.

Hypotheses

- There are no significant differences between gender, locality, experience and academic qualifications of science teachers in availability and effective use of

science laboratories in secondary schools.

- There are no significant differences between gender, locality, experience and academic qualifications of science teachers in demerits of science laboratories in secondary schools.
- There are no significant differences between gender, locality, experience and academic qualifications of science teachers in measures for effective use of science laboratories in secondary schools.

Tools Used

The tool is a self constructed and developed tool consisting of 60 items with three sections of 20 items each. The three sections of the tool are (i) availability and effective use of science laboratories (ii) demerits of science laboratories in school and (iii) Measures for effective use of science laboratories. Each item is having three options like agree, undecided and disagree with the scoring of 3, 2 and '1' mark respectively. All the items in the tool are positive items. So the range of total marks in each questionnaire will lies in between 60-180. The tool was standardized by conducting item analyses using the statistical procedures of chi-square tests. The reliability of the test is 0.75 and the validity is 0.86. So the test is highly reliable and valid.

Administration

The opinion scale along with the preliminary information of the teachers was collected from selected secondary schools from rural and urban schools. Proper instructions were given while the teachers are giving responses to the tool. Likewise the data were collected from different schools.

Sample

The final sample selected for the study is 50. The sample includes with 33 male and 17 female teachers, 31 rural and 19 urban school teachers, 21 below 5 years experienced and 29 above 5 years experienced teachers and 20 graduate and 30 postgraduate teachers constitute the sample of the study. The sample is collected by way of random sampling method.

Statistical Procedures used

The statistics like means, standard deviations and t-values were calculated to test various hypotheses framed. The t-values were used to compare the two mean scores of the variables and also to find out the value is significant or not. The statistical procedures were conducted according to the formulas given by Guilford (1978) and Garret (1971).

Limitations

- The study is limited to Visakhapatnam District.
- The sample is limited to secondary school teacher
- The measures are limited to four variables.

Results and Discussion

The mean, standard deviations and critical ratio values are reported in Table 1. The scores related to the total sample scores in all dimensions measure the perceived availability and use of science laboratories by gender, locality, experience and academic qualifications. There are no significant differences found between variables. Hence the null hypotheses framed on gender, locality, experience and academic qualifications in relation with the 'Availability and effective use of science laboratories' were accepted.

The means, standard deviations and critical ratio values of demerits of science laboratories by gender, locality, experience and academic qualifications were reported in Table 2. It can be found that there are no significant differences between variables. So the null hypotheses framed are accepted and there are no significant differences between gender, locality, experience and academic qualifications related to the 'Limitations of Science Laboratories'.

The mean, standard deviations and critical ratio values for the effective use of science laboratories' by gender, locality, experience and academic qualification were incorporated in Table 3. There are no significant differences

S.No.	Variable	Category	N	Mean	S.D.	C.R.
1.	Gender	Male	33	159.90	12.03	0.17
		Female	17	160.40	7.17	
2.	Locality	Rural	31	160.00	9.41	0.18
		Urban	19	160.50	9.40	
3.	Experience	Below 5 yrs	21	159.80	8.80	0.17
		Above 5 yrs	29	160.30	11.20	
4.	Academic Qualification	Graduate	20	160.30	7.47	0.12
		Post-graduate	30	160.00	11.90	

Not Significant

Table 1. Comparison of Variables towards the 'Availability and effective use of Science Laboratories at secondary schools'

S.No.	Variable	Category	N	Mean	S.D.	C.R.
1.	Gender	Male	33	40.33	3.90	0.93
		Female	17	42.29	8.20	
2.	Locality	Rural	31	42.16	10.28	0.21
		Urban	19	41.47	11.65	
3.	Experience	Below 5 yrs	21	41.76	8.20	0.11
		Above 5 yrs	29	42.00	14.10	
4.	Academic Qualification	Graduate	20	42.50	5.83	0.54
		Post-graduate	30	38.20	13.80	

Not Significant

Table 2. Comparison of Variables towards the 'Demerits of Science Laboratories'

between these variables. So the null hypotheses framed on measures for effective use of science laboratories were accepted and there are no significant differences found between the variables gender, locality, experience and academic qualifications related to the measures for effective use of science laboratories.

Conclusion

There are no significant differences between gender, locality, experience and academic qualifications towards "availability and effective use of science laboratories". The male and female science teachers, the rural and urban science teachers, below 5 years and above 5yrs experienced science teachers and graduate and post graduate science teachers used the laboratories in their level best without any variation.

There are no significant differences between gender, locality, experience and academic qualifications towards "Demerits of Science Laboratories". The male and female science teachers, the rural and urban science teachers, below 5 years and above 5yrs experienced science teachers and graduate and post graduate science teachers use the laboratories by adjustment even if some demerits found in the science laboratories.

S.No.	Variable	Category	N	Mean	S.D.	C.R.
1.	Gender	Male	33	58.60	6.01	0.13
		Female	17	58.50	4.04	
2.	Locality	Rural	31	58.50	5.82	0.13
		Urban	19	58.70	4.40	
3.	Experience	Below 5 yrs	21	58.71	4.76	0.06
		Above 5 yrs	29	58.56	5.56	
4.	Academic Qualification	Graduate	20	56.65	4.56	1.44
		Post-graduate	30	38.20	5.64	

Not Significant

Table 3. Comparison of Variables towards the 'Measures for effective use of science Laboratories'

There are no significant differences between gender, locality, experience and academic qualifications towards "measures for effective use of science laboratories". The male and female science teachers, the rural and urban science teachers, below 5 years and above 5 yrs experienced science teachers and graduate and post graduate science teachers use the laboratories to take necessary steps for use of science laboratories up to maximum extent.

Educational Implications

It is necessary that the science teachers have to give some in service training to organize and for maintenance of science laboratories. The Universities conduct the orientation and refresher courses for the science teachers to enhance their knowledge and practical experience.

Science teachers should develop their practical skills in explaining and demonstrating to the students. The manipulator and observational skills should be developed by the science teachers with their creativity and innovative ideology.

More funds should be allotted for the lab equipment with up-to-date material from the school managements. The sciences teachers have to play a vital role by fulfilling the requirements of the science laboratories by the funds allotted by the managements. Both the science teachers as well as managements are looking after the facilities of all the laboratories in schools along with the first aid boxes and other necessary science equipment.

Every teacher should encourage students to utilize the laboratories for obtaining practical knowledge. The science teachers have strive hard to inculcate the scientific interests and scientific attitudes among the students.

References

[1]. **Adinarayana, K. (1998).** *A critical study of the effective use of Science laboratories at Secondary school level*, M.Phil., Madhurai Kamaraj University, Madhurai.

[2]. **Anantha Lakshmi, K. (1994)**. *An investigation in to the functioning of laboratories in promoting teaching and learning of science in the secondary schools*. M.Phil. S.V. University, Tirupati.

[3]. **Garret, H.E. (1971).** *Statistics in Psychology and Education*, Bombay: Vakils, Feffer and Simons Private Ltd. (6th Ind Edi.).

[4]. **Guilford, J.P. (1978).** *Fundamental Statistics is Psychology and Education*, Mc-Graw Hill Publishing Co. New York.

[5]. **Patel, V.D. (1990).** *The study of laboratory equipment and teaching aids in General Science in Kerala district*. M.Phil, Edu. Madhurai Kamaraj University, Madhurai.

[6]. **Rajput, J.S., Gupta, U.P. & Vaidya, S. (1978).** *A Study of Science Laboratories in Western Regional College of Education*, NCERT, RIE, Bhopal.

[7]. **Ranga Reddy, K. (1994).** *A Circle Study of Laboratory facilities in Science teaching in secondary schools*. M.Phil. S.V. University, Tirupati.

[8]. **Rao, K.N. (1990).** *A Comparative study of Science laboratories in the states of Maharastra and Rajasthan*. Ph.D. Edu, Rajasthan Univ.

ABOUT THE AUTHORS

Dr. T.J.M.S. Raju is a senior faculty in the field of Teacher Education. Presently he is working as a Principal in K.P.N.College of Education, Gantyada, Vizianagaram District, affiliated to Andhra University. Basically he is from the Psychology Discipline and got his Doctoral degree from Psychology. He has participated in few International Conferences, National Seminars, Workshops, and published some papers in referred Journals. He is also having the administrative experience of an educational institution. He can be contacted via E-Mail at mounitalluri@gmail.com.

Dr. N.V.S.Suryanarayana is an eminent person in the field of Education. Presently he is working as Faculty in the Department of Education, Andhra University Campus, Vizianagaram. He has rich experience in the field of Teacher Education about a decade at Post Degree and PG level. He is very much fascinated to Psychology and interested in Educational Psychology and Guidance & Counseling. He has also participated in so many National and International Seminars, Workshops, Refresher Courses, Symposia's and published so many articles in reputed Journals. He produced a number of M.Ed and M.Phil Dissertations. He wrote so many books on recent trends in education and innovative Psychological concepts. He is having Lifetime memberships in various alleged Associations. He can be contacted via e.mail at suryanarayana_nvs@yahoo.com.