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A Study on the Availability of Chemistry Laboratory Facilities and it's Utilization in the Higher Secondary Schools of Guwahati City, Assam

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Abstract:- Science laboratories have a paramount role in teaching and learning process of practical activities. Descriptive survey method was used to investigate the upshot of the Availability of Chemistry Laboratory Facilities and its Utilization in the Higher Secondary Schools of Guwahati City, Assam. The method of selection of the schools did not require any sampling technique, since, only 10 schools were provided with science stream out of 19. Questionnaire and science laboratory input checklist were used to gather data for the study. This study reveals shortage and ineffective use of science laboratories in the high secondary schools.

Keywords:- *Availability; Chemistry laboratory; utilization; facilities; shortage.*

I. INTRODUCTION

A. Theoretical background of the study

Learning refers to the changes and modification in the individual which he undergoes from his birth till death. When we talk about academic learning, it is such a process of changes and modification that takes place in classroom or school (S.P.Chaube, 1995). Learning occurs through ones interaction with one's environment. In school, environment refers to the different facilities available to facilitate students learning outcome. Among the physical facilities such as land, building, library museum; laboratory facility is one of the most important and has been observed as a potent factor to quantitative learning (Owoeye and Yara, 2011).

No course in science can be considered as complete without including some practical work in it. The practical work is to be carried out by individual in a physical science laboratory. Most of the achievements of modern science are due to the application of the experimental method. At school stage practical work is even more important because of the fact that we 'learn by doing' scientific principles and applications are thus rendered more meaningful (Hemba, 2006). Practical class-room experiments help in broadening pupil's experience and develop initiative, resourcefulness and cooperation. Experiments play a vital role in the process of learning science. For an effective and efficient teaching of science we need well equipped science laboratories to provide a forum wherein the learner is given the exercise to subjects, his beliefs, ideas, statements, theoretical propositions etc. to some forms of experimental test (Soyibo, 1990).

Chemistry is the study that deals with the composition, properties and the use of matter. It probes into the principles governing the changes that matter undergoes and chemistry laboratory has been given a central and distinctive role in chemistry education. Thus for any meaningful teaching and learning of chemistry to take place, there ought to be functional laboratories in higher secondary schools. In spite of the priority which the national policy on education places on science subjects at all levels of education, one is not very sure whether much has been done in providing well equipped science laboratories (chemistry)in Government/Provincialized higher secondary schools with science stream in Guwahati city and if there are, one is not too sure of their proper use. Do students know the basic uses of the laboratory tools and apparatus? Do the chemistry teachers and students keep safety precautions while working in the chemistry laboratories? Oralu and Inalegwu (2000) however, lamented that a casual trip to higher secondary schools will show that our laboratories are a mess. While some researchers were of the opinion that there is no problem in availability of laboratory facilities in govt. schools, the problem is on proper management and utilization of the facilities provided in student's academic learning. Thus the focus of this study is to find out the availability and use of laboratory facilities at higher secondary schools with science stream of Guwahati city.

B. Need and significance of the study

Effective science education is the need of the day. Human thirst to acquire more knowledge for better life has been encouraging research on various branches of science and the results, discoveries and inventions in the twentieth century have been eye opener of the humanity.

The motivation to learn chemistry does not only depend on the interests that the students bring to school. It can also be the result of certain learning situations, among which we find laboratory works. A chemistry laboratory is a resource site for a chemistry science teacher as well as students (Khan and Iqbal, 2012). Therefore every school must provide labs to the students with comprehensive range of lab. Facilities and make proper utilization of it. But among schools this availability

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varies. Students face problems regarding availability of resources, lab Safety measures, irregularity in lab works etc. and as a result students sometimes unconsciously indulge in wrong practical methods and thus come to wrong results.

Hence the present study is an attempt to find out the proper availability of chemistry lab facilities in the Government/provincialized Higher Sec. Schools with science stream of Guwahati city as these schools run under govt. funding. Whether these schools are getting the required facilities, whether every resource is properly utilized and whether necessary safety measures are incorporated in management of the lab of these schools are the main concerns of this study.

C. Objectives of the study

The following objectives were framed for the present study.

- To investigate the availability and adequacy of chemistry laboratory facilities in the Higher Secondary Schools of Guwahati city.
- To determine the utilization of the laboratory resources in the Schools.
- To find out the incorporation of safety measures in management of the chemistry laboratories of the Schools.

D. Delimitation of the study

- The present study was done in Guwahati city, Assam because of time factor, financial constraint and wideness of the state.
- The study was confined to the Government/Provincialized Higher Secondary schools under Assam Higher Secondary Education Council (AHSEC) with science stream only.
- It was delimited to chemistry Laboratories, chemistry teachers and senior secondary students of the schools.
- The effectiveness of the uses in the teaching/learning process and performance of the students will not be discussed but the status of the facilities will be investigated.

II. DESIGN OF THE STUDY

A. Procedure employed

The methodology which has been adopted in this study is a Descriptive research. Again descriptive studies may be classified in the following three categories: Survey studies, Interrelationship studies and Developmental studies. This piece of work undergoes survey studies category. In the present research, data of the availability of the lab facilities and their utilization are gathered from different Govt/provincialized higher sec schools and an analysis of the collected data takes place which ultimately leads to a final conclusion and various recommendations.

B. Description of population and sample

For the present research, Guwahati city of Assam state was selected as an area of the study. The choice of the city was due to the fact that it was of easy access.

- *The population of the study*

The Population of the present study consists of all the govt./provincialized higher secondary schools with science stream of Guwahati city. On examining the school network of the city we found that there are total 19 higher sec schools in Guwahati city out of which 4 are government schools and 16 are provincialized schools.

- *Representative Sample*

Among the mentioned higher secondary schools in Guwahati, only 10 were provided with science stream, thus the method of selection of the school did not require any sampling technique. All the 10 govt/provincialized higher schools that is situated in the city, constituted the target of the study of chemistry laboratory facilities and its utilization. Thus 100% population is selected as the sample.

C. Tools of data collection

The study developed appropriate tools for the collection and analysis of necessary data. Two instruments were mainly used for the collection of data for the study: a 30 item self-designed questionnaire and a checklist.

D. Procedure of data collection

The researcher herself visited each of the sampled higher secondary schools located in Guwahati city and collected the required data by distributing the copies of the questionnaire to the chemistry teachers and few students of class XI and XII of each school. In the mean-time the investigator with permission visited the chemistry lab of the schools for observation and the check list was used during that tm.

III. ANALYSIS AND INTERPRETATION OF DATA

At the end of the data collection and consequent upon the nature of instruments used, tables of frequency counts, followed by descriptive presentation and interpretation of data were employed for data analysis.

Objective 1

To investigate the availability and adequacy of chemistry lab facilities in the Higher Secondary Schools of Guwahati city.

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S. no	Facilities	Adequate		Fairly adequate		Inadequate	
		f	%	f	%	f	%
1	Stools/ chairs	0	0	4	40	6	60
2	Students table with drawer	0	0	0	0	10	100
3	Students table without drawer/ integrated table	2	20	4	40	4	40
4	Individual shelf	0	0	4	40	6	60
5	Integrated shelf	2	20	4	40	4	40

Table 1. Table showing availability of seating arrangement in the higher secondary schools

(Total no. of school=10)
(f= frequency=no of schools).

- *Interpretation 1*

From table 1, it is observed that the percentage of inadequacy is more than adequacy. 60 % of the schools have inadequate stools, none of the schools have adequate table with drawer, only 20% of the schools have adequate integrated table, none of the schools have adequate individual self either fairly adequate (40%) or inadequate (60%), only 20 % have adequate integrated shelf.

Objective 2

To determine the utilization of the lab resources in the Higher Secondary Schools of Guwahati city.

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S. no.	Apparatus and Equipments	Available, Functional and Utilized		Available, Functional and Unutilized		Available but Non Functional		Not Available	
		f	%	f	%	f	%	f	%
1	Balances	4	40	4	40	2	20	0	00
2	Beaker	10	100	0	00	0	00	0	00
3	Blue litmus	4	40	4	40	2	20	0	00
4	Bunsen burners	10	100	0	00	0	00	0	00
5	Burettes	3	30	3	30	4	40	0	00
6	Condensers	0	00	0	00	10	100	0	00
7	Conical flask	10	100	0	00	0	00	0	00
8	Copper turnings	0	00	0	00	0	00	10	100
10	Evaporating discs	5	50	0	00	0	00	5	50
11	Funnel	10	100	0	00	0	00	0	00
12	Glass rod	0	00	0	00	0	00	10	100
13	Hot plates	0	00	0	00	0	00	10	100
14	Measuring cylinder	10	100	0	00	0	00	0	00
15	Micro wave	0	00	0	00	0	00	10	100
16	Multi-meter	0	00	0	00	0	00	10	100
17	Petri dish	2	20	8	80	0	00	0	00
18	pH meter	0	00	0	00	0	00	10	100
19	Pipette	3	30	8	80	0	00	0	00
20	Red litmus	4	40	4	40	2	20	0	00
21	Spirit lamp	10	100	0	00	0	00	0	00
22	Test tube	10	100	0	00	0	00	0	00
23	Test tube holder	3	30	0	00	0	00	7	70
24	Test tube stand	4	40	0	00	0	00	6	60
25	Test tube brushes	0	00	0	00	0	00	10	100
27	Thermometers	0	00	1	10	0	00	9	90
28	Volumetric flask	0	00	0	00	0	00	10	100
26	Weighing balance	3	30	3	30	0	00	4	40

Table 2. Table showing availability and utilization of apparatus and equipments in the higher secondary schools.

➢ *Interpretation 2*

Table 2 shows that the percentage of schools with available and utilized apparatus and equipments is low than with unutilized. Beaker, Bunsen burner, condenser, measuring cylinder, spirit lamp and test tube are utilized most in all the schools; i.e, 10 (100%) under study. Electrolagtic cells are least utilized, only 10% schools. In all the schools condensers are found to be available but not functional. In 20% schools (2), balances and blue litmus are available but not functional. The percentage of schools with unavailable apparatus and equipments are much more, copper turning, test tube brushes, thermometers volumetric flask, water bath, glass rod, hot plates, microwave, millimeters, ph meter and refrigerator etc are unavailable in 100% schools. Table 2 is graphically represented below:

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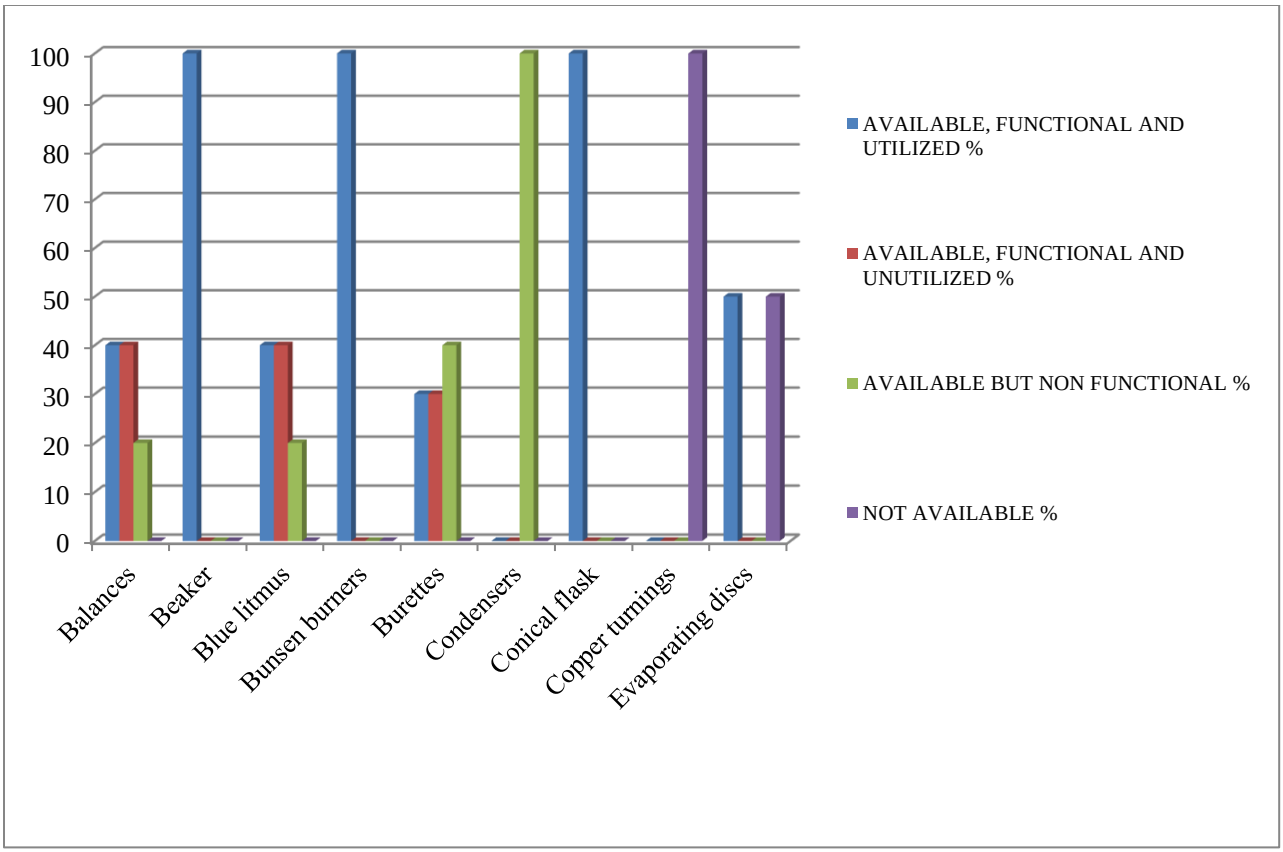

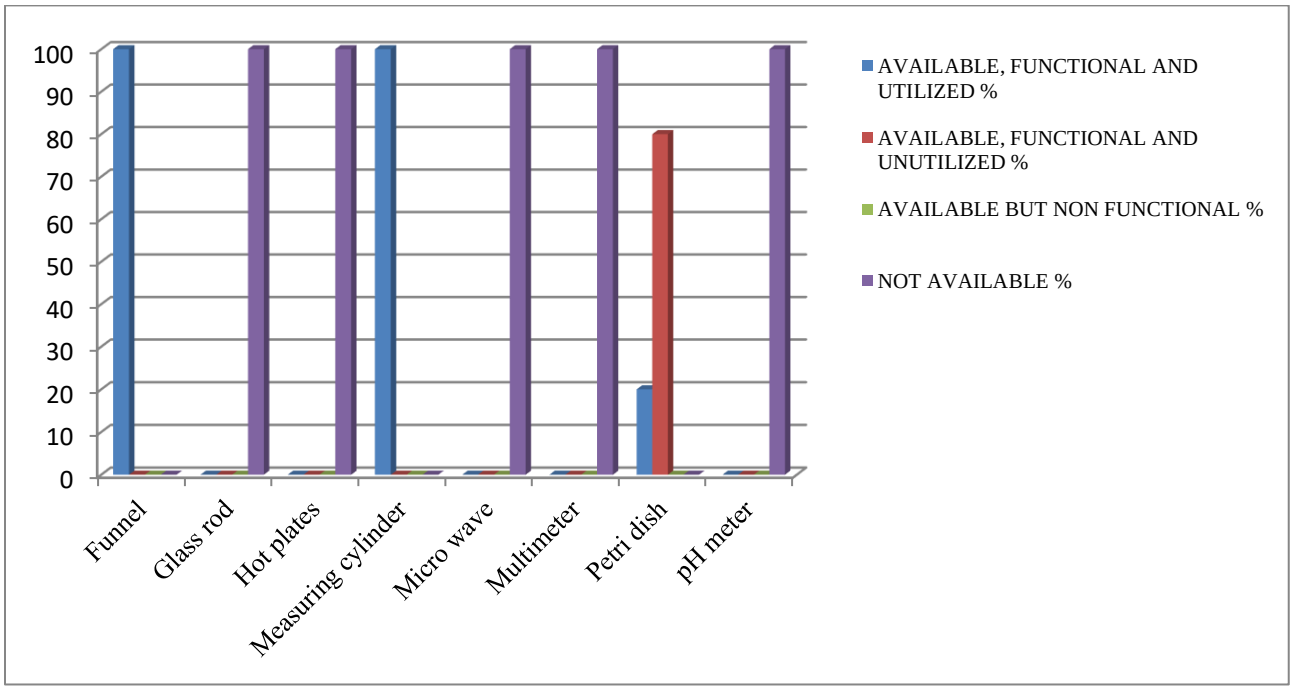

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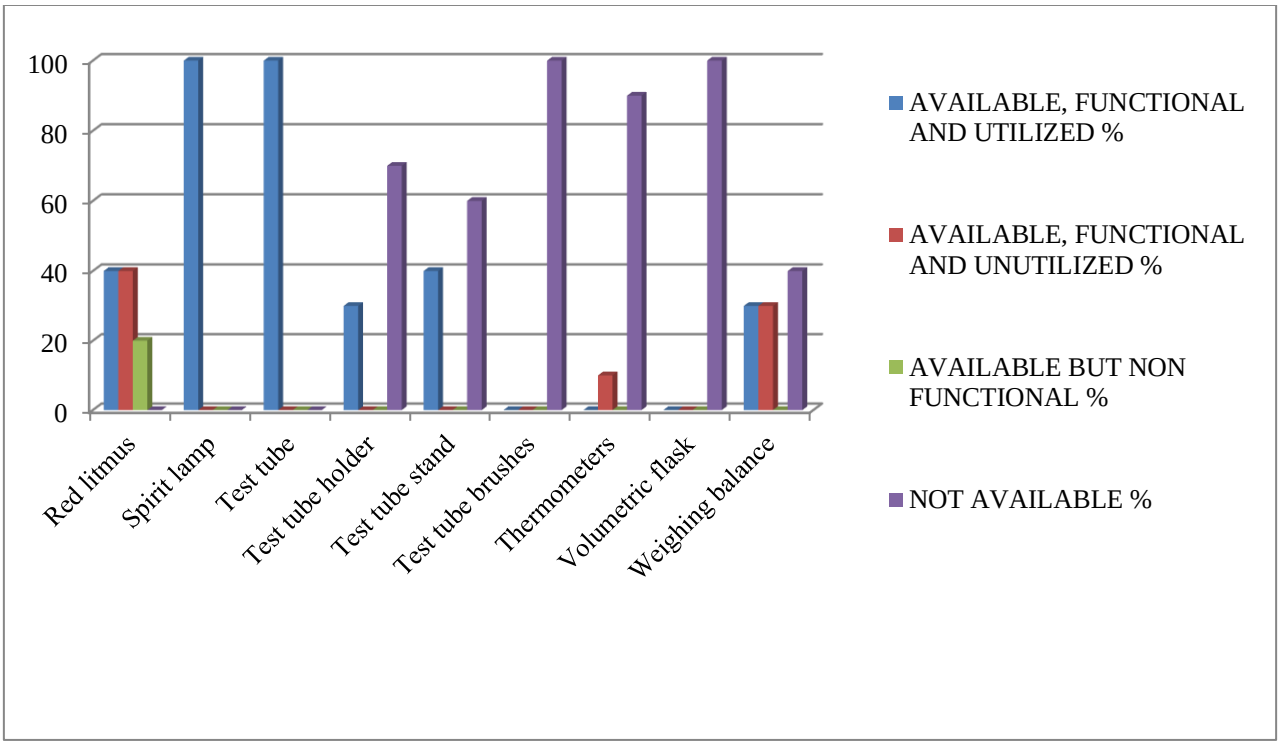

Fig 1, 2and 3:- Graphical representations of table 2. Availability and utilization of apparatus and equipments in the sampled higher secondary schools

Objective 3

To find out the incorporation of safety measures in management of the chemistry laboratory in the Higher Secondary Schools.

S. no.	Safety measures	Present	
		f	%
(a)	Preparatory room attached to science Lab.	2	20
(b)	Dustbins provided with lids	0	00
(c)	Gas supply with appropriate fitting	3	30
S. no.	Safety measures	Present	
(d)	Floor of Lab made of rough concrete	10	100
(e)	Adequate provision of storage facilities	0	00
(f)	Labels on all chemicals with poisonous ones clearly identified	0	00
(g)	Adequate ventilation	10	100
(h)	Provision of water and soap for hand washing	10	100
(i)	Apron	0	00
(j)	Provision of appropriate fire extinguishers	4	40
(k)	Provision of well pasted rules and regulations	0	00

Table 3. Table showing Safety Measures Employed in the chemistry Laboratories of the Sampled Schools.

➢ *Interpretation 3*

From table 3 it is clear that incorporation of safety measures is very poor in the Schools. According to the table, none of the schools (0%) have dustbins provided with lids, Adequate provision of storage facilities, Labels on all chemicals with poisonous ones clearly identified, apron and Provision of well pasted rules and regulations. 2 schools (20%) have Preparatory room attached to science Lab. 3 schools (30%) have Gas supply with appropriate fitting.

➢ *Summary of Major Findings*

Results presented above in Tables 1 to 3 indicated the following:

- The study revealed that the seating arrangement in most of the schools were not satisfactory as it was found either fairly adequate or inadequate in having stools, individual tables with or without drawer and appropriate shelves.
- It was also found that use of certain facilities such as computers and overhead projectors were nil in the laboratories of the schools.
- The study revealed that in few schools apparatus and equipments were available and utilized, again in few schools it were found available but not utilized but in most school some of the apparatus and equipments were not at all available.
- One of the reasons behind the less utilization in the sampled Schools is found to be the presence of broken glassware in greater number.
- Safety measures incorporated in the schools were not proper and tight.

IV. CONCLUSION

The improvement of higher secondary school science laboratory is not a local problem but a problem of the entire country. The purpose of the study is to analyze the availability of chemistry laboratory facilities in Govt/provincialized higher secondary schools. Therefore the investigator has taken the step to find out the availability of chemistry laboratory facilities in govt/provincialized higher secondary schools of Guwahati city. It can be concluded from the present investigation that the study of chemistry laboratory facilities which is one of the most potent determinant of students learning is found unsatisfactory, because there is a lack of sufficient lab facilities in the higher secondary schools surveyed. The best teaching of science can only be accomplished with the best laboratory facilities.

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