

# Asian Resonance

## Assessment of Laboratory Competence Status of Chemistry Students in Senior Secondary Schools

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#### Abstract

Chemistry Experiments are meant to learn scientific procedure and students can learn skills to become competent scientist, forensic investigator, lab technicians and other related fields. So it is necessary to assess the lab competence in prior stage of higher education to become professionals. This research is aimed to study the Laboratory competence status of senior secondary students. Total 240 chemistry students of twelfth class (40-40 students from each school) are randomly selected from six UP and CBSE Board schools (three schools of each board). From the results it is showed that CBSE Board students slightly high competent than UP Board students in the Chemistry Laboratory work but overall result reveal that students have low competence in laboratory work. Most of the students cannot recognize and handle the commonly used apparatus properly and they are poor in drawing inferences and reporting result from some experiments done in the laboratory.

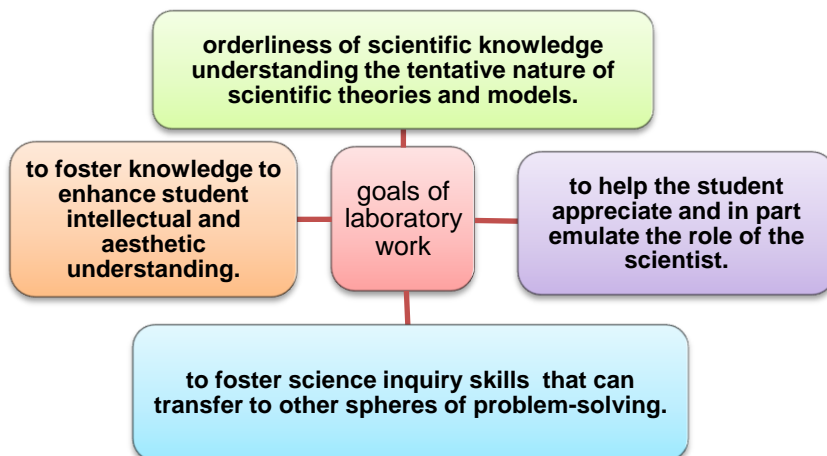
**Keywords :** Laboratory Competence, Senior Secondary students

#### Introduction

Chemistry has been identified as a very important science subject and its importance in scientific and technological development of any nation has been widely reported. Acquisition of appropriate scientific and technological skills is necessary to cope with the challenge presented by the evolving needs of modern work place in our industries and the ever growing non-formal sector. Education and training systems that responds adequately to these demands will therefore, contribute to the efforts to overcome the growing unemployment and marginalization of majority of the populace. By providing access to appropriate learning experience designed to broaden skills and knowledge can increase productivity and significantly improve the fortunes of the unemployed, thereby reducing poverty and unemployment amongst our youth. Therefore, the attention should be given on teaching of chemistry. Science teachers have always given the importance of practical work as a means of introducing learners to the scientific process of experimentation. The simplification of subject for better understanding should be done carefully since it may cause students to develop wrong ideas. Laboratory activities have long a distinctive and central role in the chemistry curriculum and chemistry educators have suggested that many benefits acquire from engaging students in chemistry laboratory activities (Hofstein&Lunetta, 1982; Garnet, Garnett & Hackling, 1995; Lunetta, 1998; Tobin, 1990; Hofstein&Lunetta, 2004). Practical work in chemistry education was used to engage students in investigations, discoveries, inquiries, and problem-solving activities. In other words, the laboratory became the center of chemistry teaching and learning. The value of laboratory led education is not only recognized by the academic and private sector but is also highly valued by students themselves, who appreciate the opportunities, contextualisation and challenges that laboratory practical offer (Hofstein&Lunetta, 2004)

Bransford, D. J. (1998), in his own write up summarized the goals of laboratory work in the following four main domains:

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**Fig. 1: showing goals of laboratory work in science teaching**

Competence word includes skill rather than knowledge. According to Dictionary of education, "Skill is the ability to use one's knowledge effectively and readily in execution or performance, technical expertness a power or habit of doing any particular thing competently. In the present study Competence is an Individual's capacity to acquire knowledge and skills in a specified area of chemistry laboratory work. The National Science Education Standards (National Research Council, 1996) and other science education literature (Lunetta, 1998; Bybee, 2000; Hofstein&Lunetta, 2004) emphasise the importance of rethinking the role and practice of laboratory work in science teaching in general and in the context of chemistry education in particular.

But now days many of the schools do not emphasis on practical work and make them spoon feeding of theoretical concepts without using experimentation. When the students enter in college they don't perform experiments skillfully and become nervous to handle the equipment and chemicals. Experiments are meant to learn scientific procedure and students can learn skills to become competent

scientist, forensic investigator, lab technicians and other related fields. So it is necessary to assess the lab competence in prior stage of higher education to become professionals.

**Objectives of the Study**

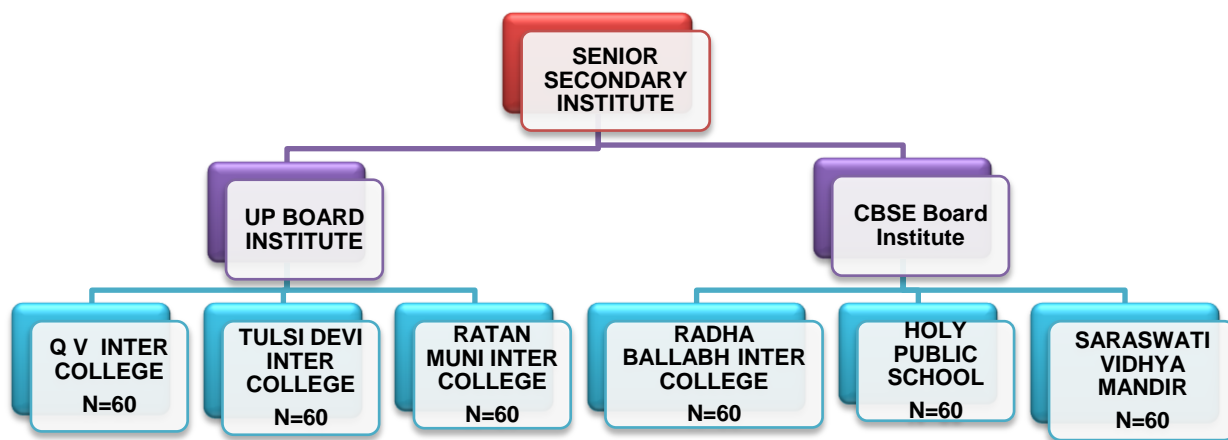
- 1 To study the Laboratory Competence of UP Board Chemistry students.
- 2 To study the Laboratory Competence of CBSE Board Chemistry students.
- 3 To Compare Laboratory Competence between UP and CBSE Board Chemistry students.

**Hypotheses of the Study**

There is no significant difference between Laboratory Competence of UP and CBSE board Chemistry students

**Sample of the Study**

The target sample includes the chemistry students of intermediate schools (class XII) affiliated to UP Board and CBSE Board. To study the Chemistry Laboratory Competence, total 240 chemistry students selected from the four institutions (60 students each institution) of Agra city by using lottery system.



**Fig. 2: Exhibiting the Sampling Procedure**

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## Methodology of the Study

### Method

Descriptive survey method is used by the researcher.

### Tool

Together data, Chemistry Laboratory Competence Testis used. This test is prepared by Meena Buddhisagar Rathod and Renu Moyade Kotwalewhich is published from Indore (MP) in 2011.

### Statistical Techniques

Mean, SD, skewness, kurtosis and t-test are used to analyse and interpret the data.

### Findings and Discussion of the Study

#### To Analyse the Nature of Laboratory Competence Scores of UP Board Chemistry Students.

To know the nature of distribution of obtained scores, mean, standard deviation, Kurtosis and Skewness of the Laboratory Competence scores are computed for further analysis.

**Table. 1: Exhibiting Descriptive Statistics for the Distribution of Scores of Laboratory Competence of UP Board Chemistry Students**

| Board    | N   | M     | SD   | Ku    | Sk     |
|----------|-----|-------|------|-------|--------|
| UP Board | 120 | 30.46 | 7.99 | 0.259 | 0.1520 |

It is gleaned from the table.1, that UP board students are found below average in Chemistry laboratory Competence. Scores are found positively skewed. It means most of the students are lie at lower scores on Laboratory Competence test and have low competence of doing laboratory work. From the value of kurtosis it is revealed that scores are quite normally distributed.

#### To Analyse the Nature of Laboratory Competence Scores of CBSE Board Chemistry Students

To know the nature of distribution of obtained scores, mean, standard deviation, Kurtosis and Skewness of the scores of Laboratory Competence are calculated.

**Table.2: Exhibiting Descriptive Statistics for the Distribution of Scores of Laboratory Competence of CBSE Board Chemistry Students.**

| Board      | N   | M     | SD   | Ku    | Sk    |
|------------|-----|-------|------|-------|-------|
| CBSE Board | 120 | 37.18 | 8.24 | 0.150 | 0.175 |

From the above table .2, it is concluded that CBSE board students have average level of lab competence. Platokurtic value is found and scores are positively skewed. It means most of the students scores at the low to average level of competence i.e. skills needs to be improvement in all the dimensions.

#### To Compare Laboratory Competence between UP and CBSE Board Chemistry Students

For analyzing the objective the researcher has used the statistical techniques viz mean, S.D and also applied test of significance as shown in figure 4.6:

**Table. 3: Showing Statistical Measures of Laboratory Competence between Different Boards**

| Board    | N   | M     | SD   | t-value | p    |
|----------|-----|-------|------|---------|------|
| UP Board | 120 | 30.46 | 7.99 | 2.18    | 0.05 |
| CBSE     | 120 | 37.18 | 8.24 |         |      |

The above table. 3 reveals that the mean values of Laboratory Competence scores obtained by UP Board and CBSE board students are 30.46 and 37.18 respectively, which depict that CBSE board students show slightly high mean value of Lab competence than the UPboard students. The t-value between UP and CBSE board Chemistry students is 2.18 which is higher than the table value i.e 1.98 at 0.05, hence it is concluded that there is significant difference found between Laboratory Competence of UP and CBSE board Chemistry students . So, on the basis of this objective the formulated hypothesis that, "There is no significant difference between Laboratory Competence of UP and CBSE board Chemistry students" was rejected at 0.05 level of significance.

**Table. 4: Showing Statistical Measures of Laboratory Competence Scores According to Dimensions of Laboratory Competence**

| S. No. | Dimensions   | UP Board |      | CBSE Board |      | S. No. |
|--------|--|----------|------|------------|------|--------|
|        |  | Mean     | SD   | Mean       | SD   |        |
| A      | Skill of handling apparatus                                    | 6.35     | 2.06 | 7.64       | 2.24 | 4.49   |
| B      | Skill of investigation   | 3.21     | 2.78 | 4.00       | 2.13 | 7.74   |
| C      | Skill of drawing inference and reporting results               | 3.40     | 3.15 | 3.56       | 2.36 | 0.44** |
| D      | Skill of Computation and measurement                           | 4.05     | 2.56 | 5.42       | 2.14 | 4.50   |
| E      | Skill of using and differentiating commonly used lab apparatus | 11.15    | 2.01 | 13.25      | 1.95 | 8.23   |
| F      | Skill of using safety measures                                 | 2.35     | 2.84 | 3.70       | 2.02 | 4.24   |

\*\* - showing insignificant value at 0.01 level of significance

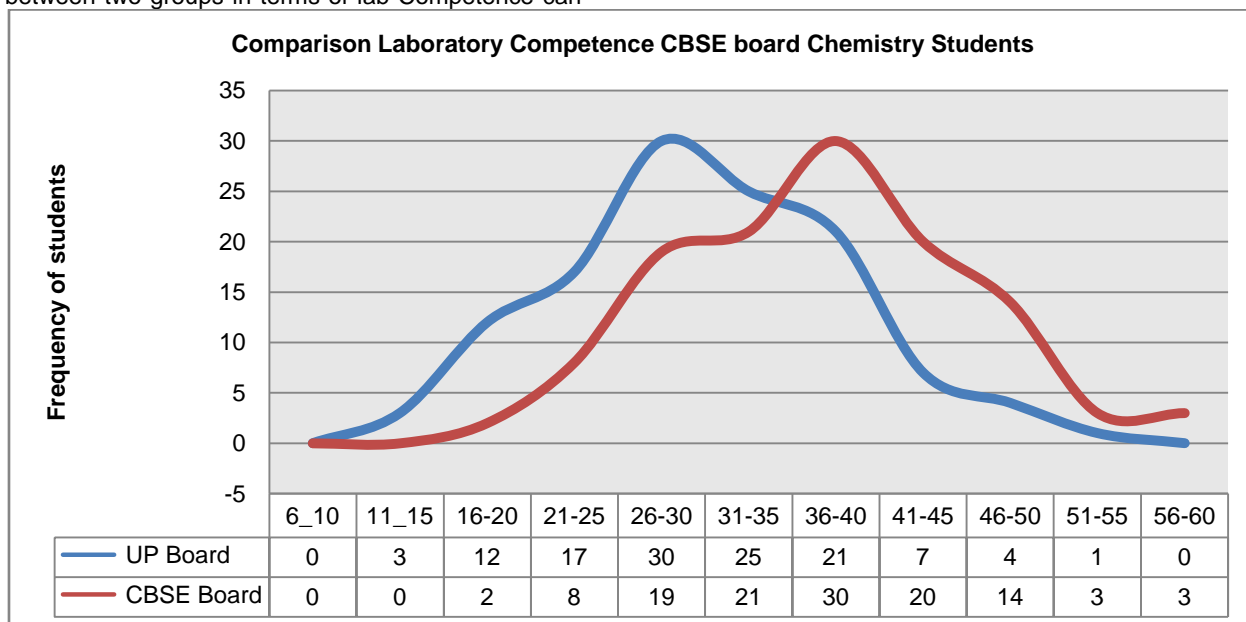
From the above table.3, it is indicated that there is significant difference found between lab competence of UP and CBSE board chemistry students with respect to five dimensions (i.e. skill of handling apparatus, investigation skill, skill of computation and measurement, skill of using and differentiating commonly used apparatus, skill of using

safety measures) at 0.01 level. This means CBSE students are more skilled in Chemistry practical work than UP board students as it may be due to the curriculum, methodology use by the boards.

Where as in third (C) dimension, insignificant difference is found between skill of drawing inferences and reporting results of UP and CBSE board chemistry students. This shows that both groups have very low competence in drawing inferences and can't

be able to report results sufficiently. The difference between two groups in terms of lab Competence can

be seen through graph.1 given as follows:



### Conclusion and Suggestions

Overall it is concluded from the study that students are not enough competent as they should be in the chemistry laboratory work. Even, most of the students cannot recognize and handle the commonly used apparatus properly and they are poor in drawing inferences and reporting result from some experiments done in the laboratory. This is seen in sampled institutes that most of them use lecture method and experimentation in the lab as a formality. Teachers have over workload and lack of time to make the students clear the concept through certain innovative approaches like inquiry approach, problem based approach, cooperative approach. Lazarowitz and Tamir, characterize cooperative learning in the science laboratory as peer tutoring in small investigative groups. They suggest that, in such laboratories, the learning environment is highly affected by the fact that the students are free to study at their own pace, ask questions, interact with each other and with their teachers, and seek information from various sources. Elvan ĠNCE AKA et.al (2010) found in his study that problem solving methods are capable of increasing science process skills scores rather than traditional approach. Kanli, U. and Yagbasan, R. (2010), in their study found that the laboratory approach based on 7E learning cycle model applications are more effective than the traditional verification laboratory approach applications to development of students' science process skills. These studies supported that using innovated methods in laboratory, competence in chemistry practicals can be increased.

There are some reasons noted by the researcher with reference to poor outcomes in chemistry which in turn may be the causes of low Competence in Chemistry laboratory work such as,

Raimi reported to have a negative impact on students' performance in chemistry is laboratory adequacy, which is an environmental factor and observed that some students really felt they would have performed better if exposed to practical lessons in good time. This is in line with Farounbi who argued that students tend to understand and recall what they see more than what they hear as a result of using laboratories in the teaching of sciences, but most schools lack functional laboratories. Lawrence suggested from his study that time constraint is one of the major factors responsible for the poor performance. It is the reason while syllabuses are not covered, science practical are not conducted. Students are also discouraged because it requires so much attention and they are not ready to sacrifice the time meant for other things. The number of periods given to chemistry per week and the time allocated for each lesson is usually not enough for effective learning because the teacher cannot conduct any meaningful practical within the time limit (Lawrence and Abraham).

#### It is Suggested from the Study:

More time should be spent on practical work done in Chemistry.

Innovative approaches should be incorporated in laboratory teaching.

Laboratory facilities should be adequately given to students.

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