

# Status of Chemistry Laboratory and Practical Activities in Secondary and Preparatory Schools of East Gojjam, Ethiopia

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## Abstract

Science laboratory is a very important resource input for teaching science. Learning science is enhanced and the understanding level is improved when students are engaged in science laboratory for practical experiments. Since chemistry is a branch of science, it should be also assisted with practical activities. The current study aimed to assess the status of chemistry laboratory and practical activities in secondary and preparatory schools of East Gojjam zone. A random sampling technique was employed to collect data from students and chemistry teachers of the study area. Structured and semi-structured questionnaires and observation of laboratories was used. Both teacher's and student's response in the study area agree on the significance of practical laboratory works to learn chemistry is very high. The result shows as Grade 9 and grade 10 students never do practical work in the lab but grade 11 and grade 12 students sometimes conduct practical work in the lab. This may be one of the reasons why only 8,688 (11.5%) students have joined the natural science field according to the 2009 E.C. East Gojjam Zone Educational Bureau report. Preparatory school students also conduct only few experimental activities among the experiment listed in their own chemistry text book. As teachers give the reasons on why laboratory work is not used to teach chemistry is because of lack of chemicals and apparatuses, fear of chemicals, lack of administration support, the lab is poorly organized, no time is allotted for practical lab work, practical lab work is not considered as a teaching load for teachers and lack of laboratory training on how to use laboratory to teach chemistry in high and preparatory schools. Generally the above problem hinders practical activities in the laboratory and makes students at secondary schools of the study area lack interest to join science class.

**Keywords:** Laboratory, secondary and preparatory school, practical activity, chemistry.

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## Introduction

A school laboratory investigation is a unique learning environment in which students can work cooperatively in small groups or the field that provides students with opportunities to interact directly with natural phenomena and develop skills of manipulative, observation, deduction and interpretation [1, 2]. A laboratory work can give rich learning experiences to students and acts as a bridge from the conceptual to the actual [3]. In addition, there are many other important practical skills to be developed in lab like team working, reporting, presenting, discussing, time management and developing ways to solve problems [4]. It is also the place where physical activities are performed and learning experiences are shared among students that enable them to understand the natural world [5]. It can be also defined; it is a learning environment that warrants a radical shift from teacher-directed learning to "purposeful-inquiry" that is more student-directed [6].

Basically, laboratory skill is the first in a series of lecture plus practical courses that provides an overview of theory, developing logical reasoning, application, and hands-on experience in science courses. Learning is an active, interpretive, interactive process [7]. Lab activities can bring a radical change in thinking among students that enables them to construct their own scientific knowledge and understanding. Lab activity has also the potential to enhance constructive social relationships as well as positive attitudes and cognitive growth of students. This is because a lab activity opens the chance of working together, in groups [1]. Therefore, it is undeniable that science laboratories have a great role to create qualified and competent professionals in science or to enhance the quality of science education [8].

The success of producing competent applicants to science and technology is influenced by the extent to which preparatory schools prepare students in terms of lab skills since preparatory schools are the bases in preparing students for science in higher education by introducing students the central conceptual and procedural knowledge and skills in science [9]. Students should be exposed to laboratory equipment, activities and precautions or safety rules to develop the required preliminary knowledge, skill and attitude that enable them to be successful in the profession as well as to achieve quality of education in science [10]. In chemistry a lot of experimentation is involving to demonstrate a known truth, to examine validity of a hypothesis and to determine the efficacy of something new [2].

In East Gojjam Zone there are 40 high schools and 22 preparatory schools. In these schools, there are a total of 75,435 students attending their education according to the 2009 E.C report of East Gojjam Zone Educational Bureau. In this report, only 8688 (11.5%) students have joined the natural science field. The percentage of students who joined natural science field is very small. This may be because of absence of practical activities in the lab and

lack of lab skills. The aim of this work is to assess the status of chemistry laboratory and practical activities in secondary and preparatory schools of East Gojjam, Ethiopia

### Description of study area

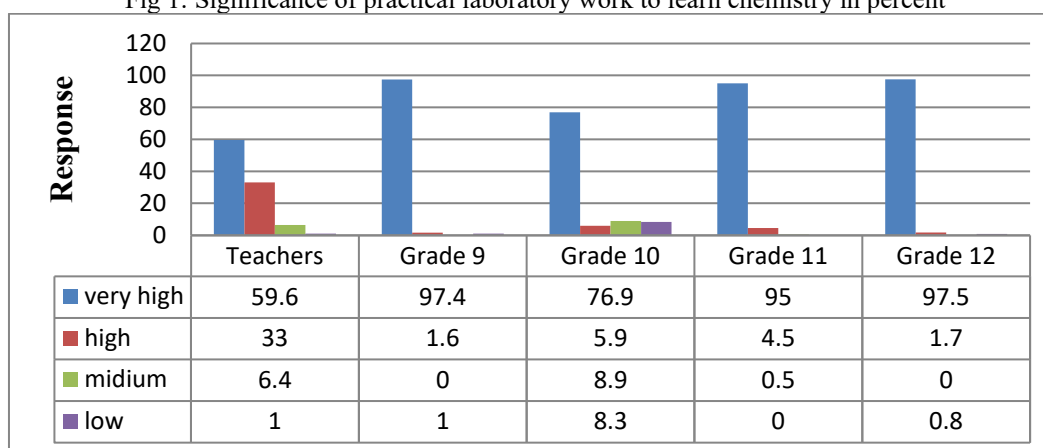
East Gojjam is one of zones in Amhara region which is bordered on the south by the Oromia Region, on the west by west Gojjam, on the north by Debub Gondar, and on the east by Debub Wollo; the bend of the Abay River defines the Zone's northern, eastern and southern boundaries [10]. East Gojjam is located at distance of 299 km in the North West direction of Addis Ababa, 265 km from Bahir dar the Capital of Amhara Regional State.

### Methods of data collection and sampling

Descriptive survey study was used to assess the status of chemistry laboratory and practical activities in chemistry of secondary and preparatory schools of East Gojjam zone. The data was obtained from primary sources through self-administrated open ended and close ended questionnaire. A sample of 180 students and 94 teachers from population was selected to generalize the whole students and chemistry teachers to make the overall conclusions. The target population was students of grade nine; ten, eleven, twelve and chemistry teachers who teach chemistry from grade 9-12 using random sampling technique.

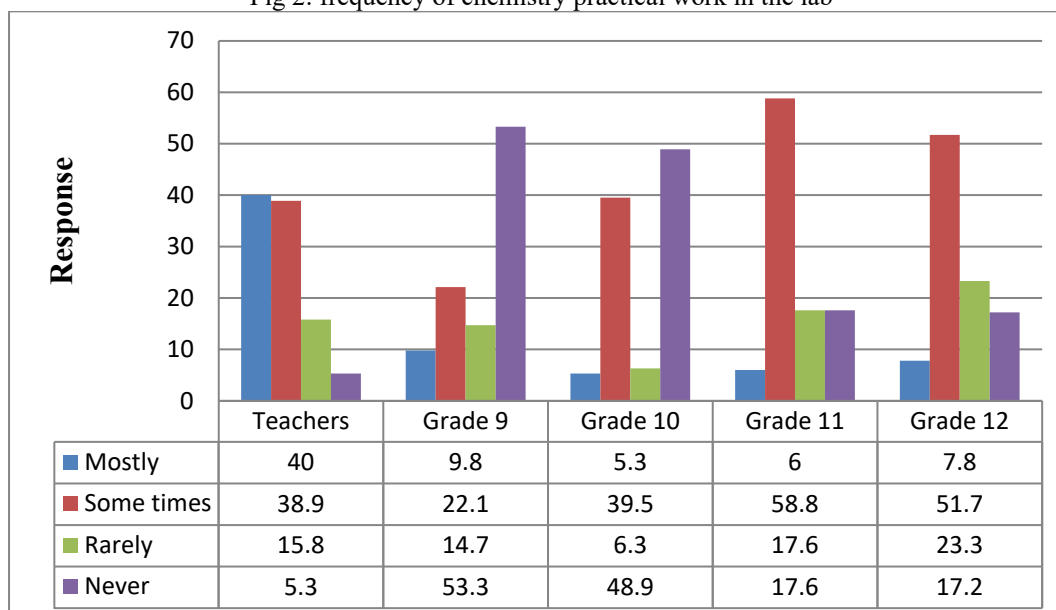
### Results

Fig 1: Significance of practical laboratory work to learn chemistry in percent



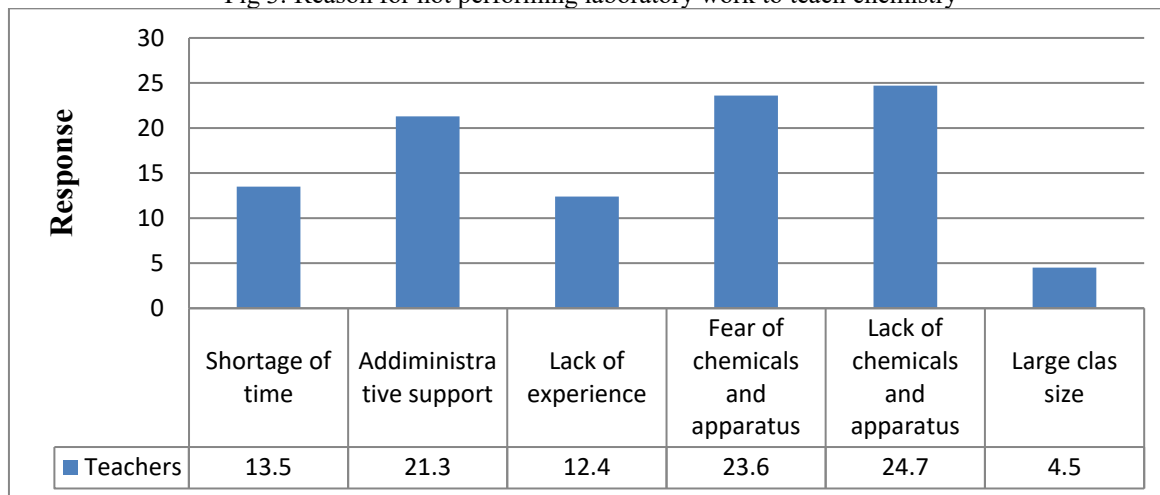
As shown in the above figure teacher's opinion regarding to the significance of practical lab work to learn chemistry is very high. From grade 9 to grade 12 students again respond as the significance of practical laboratory work to learn chemistry is very high. Both teachers and students response agrees as the significance of practical laboratory works to learn chemistry are very high.

Fig 2: frequency of chemistry practical work in the lab



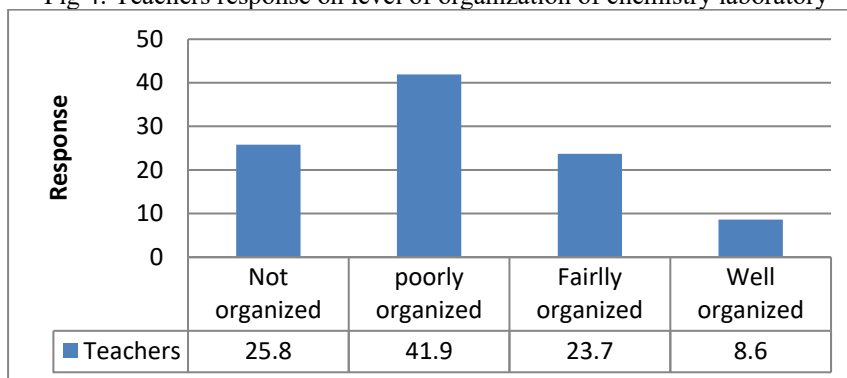
Teacher's response on the frequency of chemistry practical work in the lab is as they mostly use laboratory work to teach chemistry using laboratory work from grade 9-12 students. In figure 2, it is clear that grade 9 and grade 10 students never do practical work in the lab. But grade 11 and grade 12 students sometimes do practical work in the lab. In the above figure different type of information is obtained. One is grade 9 and 10 students never conduct lab but relatively grade 11 and 12 conduct lab work. The second is teachers respond as they use practical lab work to teach chemistry. Teachers may respond as they use laboratory to teach chemistry because they teach grade 9 and 10 and grade 11 and 12 students too.

Fig 3: Reason for not performing laboratory work to teach chemistry



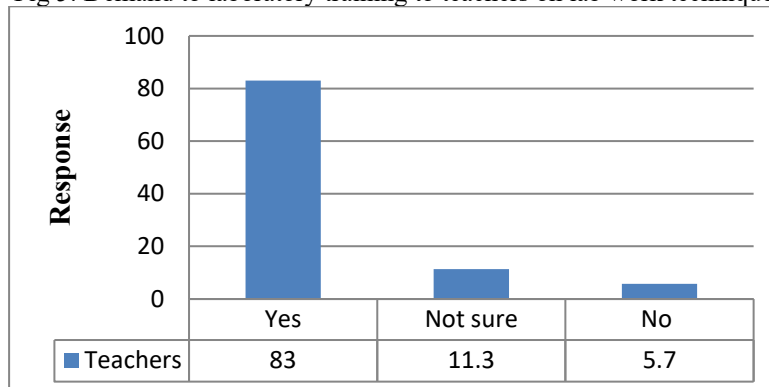
The teachers response on the reasons why laboratory work is not used to teach chemistry is because of lack of chemicals and apparatuses, fear of chemicals and lack of administration support accounts the first, second and third order as a reason for not performing lab demonstration.

Fig 4: Teachers response on level of organization of chemistry laboratory



In figure 3: the response shows the presence of shortage of chemicals and apparatus. On the other hand, fig 4: shows the available chemicals and apparatuses are poorly organized. Organized lab and availability of chemicals and apparatus are very important to conduct chemistry lab to teach and learn.

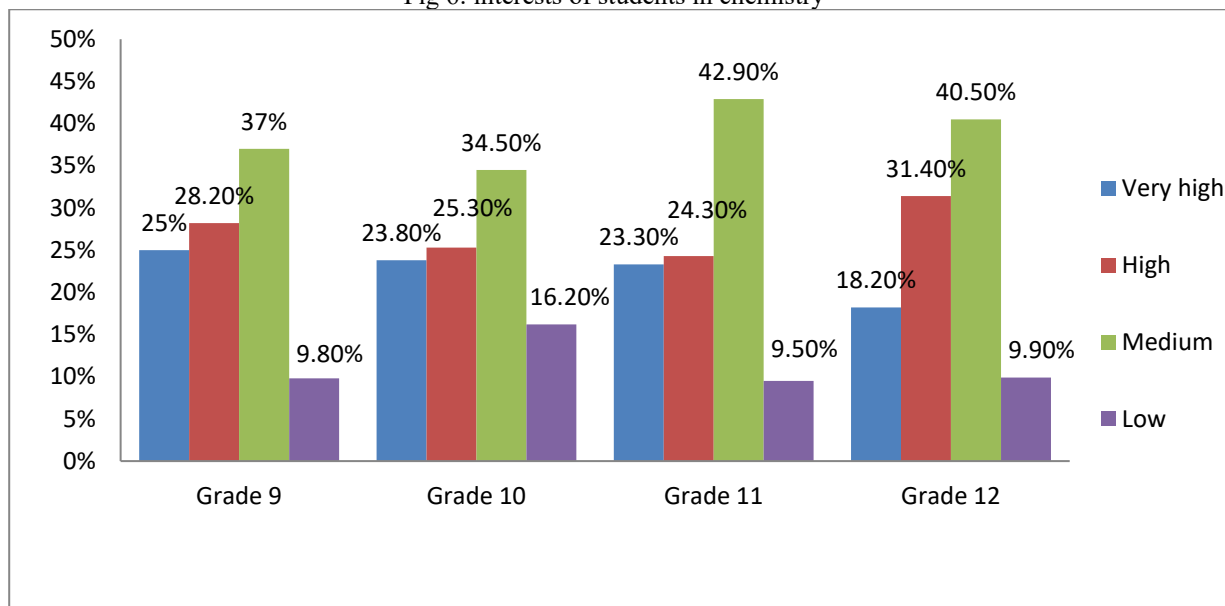
Fig 5: Demand to laboratory training to teachers on lab work technique.



As we can see in fig 5: most of teachers respond as they need laboratory training to use laboratory to teach

chemistry in high and preparatory schools.

Fig 6: interests of students in chemistry



As shown from figure 6, the interest of students in chemistry subject from grade 9 to grade 12 is medium. The decreasing order of interests of students in chemistry subject from grade 9 to grade 12 is medium, high, very high and low. As we can see from the figure in all grade levels the interests of students in chemistry is good. But additional work is required to increase their interest on chemistry subject.

Fig 7: reasons for low interesting students in chemistry

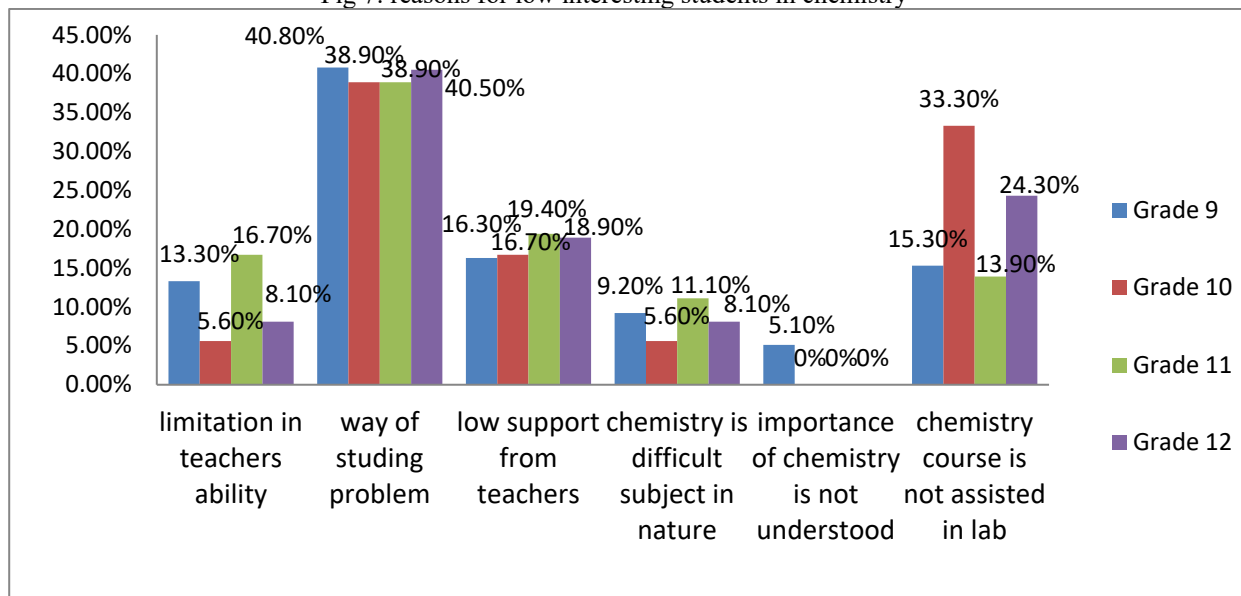
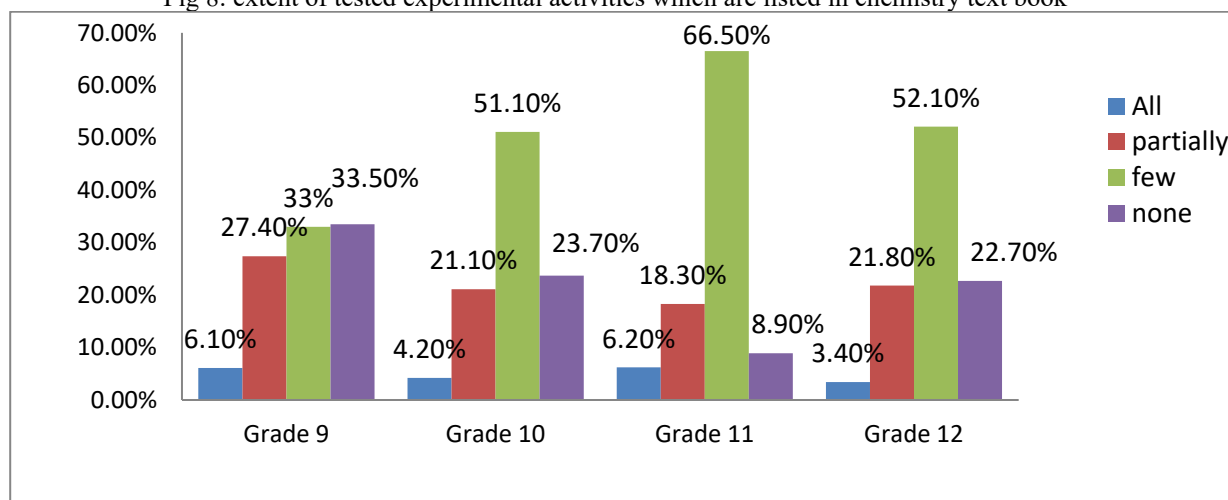


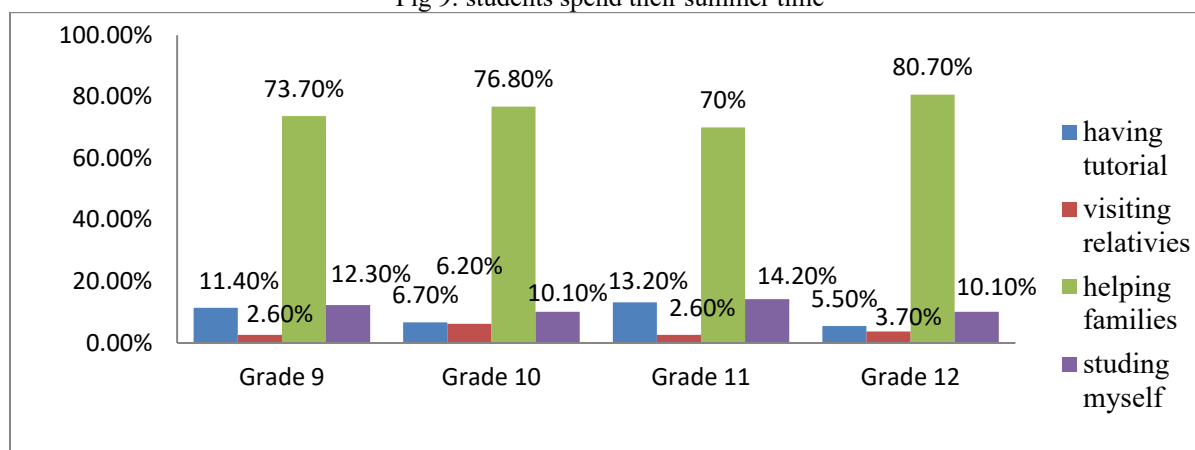
Figure 7 clearly shows that the first reason for low interesting students in chemistry is way of studying problem and the second reason is chemistry subject is not assisted by laboratory work. As the response shows students need support regarding way of studying and chemistry course should be assisted with practical activities.

Fig 8: extent of tested experimental activities which are listed in chemistry text book



In the above figure the response of students from grade 9 to 12 shows few and none of the experimental activities in chemistry subject is conducted but not more than 6.2% respondent respond as all the activity in the chemistry text book is conducted. Therefore, we can understand only few experimental activities in chemistry text book of preparatory and high school is tested.

Fig 9: students spend their summer time



As shown from figure 9 more than 70% of students spend their summer time by helping their families. Only few students spend their summer time by studying and having tutorial class. This indicates that students spend very small time for their education. Any interested body can use summer time to support east Gojjam students by giving tutorials on their courses and giving advice on their method of study.

### Summary

Practical laboratory work is a very important for teaching natural science and chemistry in particular and Teachers' and students' opinion regarding the effect of lab work on students learning is very high and they are interested to conduct the lab. But practically chemistry course is not assisted in lab to teach and learn. The reason is lack of chemicals and apparatuses, fear of chemicals, lack of lab training and lack of administration support. On the other hand available chemicals and apparatuses are not organized. From open ended questions teachers indicate that time is not allotted for the practical lab work and it is not considered as a load for teachers.

### Recommendations

Any responsible bodies should conduct positive intervention regarding time allotment for practical lab work, train the teacher on chemistry lab work, organize the lab and support necessary chemicals and apparatus in the study area.

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