SCHOOL OF GRADUATE STUDIES

TEACHER AND STUDENT PERCEPTIONS TOWARD PRACTICAL ACTIVITY IMPLEMENTATION IN CHEMISTRY TEACHING AND LEARNING IN SOME SELECTED SECONDARY SCHOOL; THE CASE OF WEST SHOWA ZONE WALMARA WOREDA, OROMIA, ETHIOPIA.

MSc THESIS

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Teacher and Student Perceptions toward Practical Activity Implementation in Chemistry Teaching and Learning;The Case of West Showa Zone Walmara Woreda, Oromia, Ethiopia.

A Thesis Submitted to the Department of Chemistry, College of Natural and Computational Sciences in Partial Fulfillment of the Requirements for the Degree of Master of Science (MSc) in Chemistry

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DECLARATION

I declare that this thesis entitled **Teacher and Student Perceptions toward Practical Activity Implementation in Chemistry Teaching and Learning in Some Selected Secondary School**; The Case of West Showa Zone Walmara Woreda, Oromia, Ethiopia.

In Partial fulfillment of the requirements for the degree of Master of Science in Chemistry is my own work and has not been submitted to any university for similar purpose. The references used in this thesis are duly recognized by proper citations.

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We hereby certify that we have read and evaluated this thesis prepared by Naol Namomsa entitled; **"Teacher and Student Perceptions Toward Practical Activity Implementation in Chemistry Teaching and Learning in Some Selected Secondary School**; **The Case of West Showa Zone Walmara Woreda"** prepared under my guidance by Naol Namomsa Daba. We recommend that the Thesis shall be submitted as fulfilling the requirements of MSc. Degree in chemistry.

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As members of the board of reviewers of the thesis open defense by **Naol Namomsa** have read and evaluated the thesis entitled " **Teacher and Student Perceptions Toward Practical Activity Implementation in Chemistry Teaching and Learning in Some Selected Secondary School; The Case of West Showa Zone Walmara".** This is, therefore, to certify that the thesis is accepted as fulfilling the Thesis requirement for the degree of Master of Science in Chemistry.

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ABBREVIATIONS

MoE: Minister of Education

NETP: New Education and Training Policy

NGO: Non-Governmental Organization

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ABSTRACT

This study investigates the perceptions of teachers and students regarding the practical implementation and activities in chemistry classrooms. The study aimed to explore the factors influencing the effectiveness of chemistry education and identify strategies to improve student engagement and learning outcomes. To achieve these objectives, data were collected from three secondary school (Kolobo, Talacho and Suba) students, teachers and directors. In doing this study, quantitative and qualitative research methods and descriptive survey design were used. Stratified random and purposive sampling was used in the selection of study participants. The data were obtained through questionnaires, observation, and interviews. Based on the analyzed data, the findings of the study revealed that students, teachers and directors perceived that chemistry practical courses (experiments) are relevant to students learning. Additionally, the findings of this study also showed that despite its relevance, the practice of laboratory work is very low. Furthermore, the lack of resources (such as laboratory equipment), the lack of time to practice laboratory work, and students' lack of engagement in laboratory activities were the major factors that affected the implementation of laboratory work. The study provides valuable insights into the importance of effective communication, hands-on experiments, and real-world applications in chemistry education. Finally, it recommends that this study can inform curriculum development and instructional practices to enhance student learning and satisfaction in chemistry classrooms. It provides educators can implement strategies to enhance the learning experience in chemistry classrooms.

***Key words**: Chemistry education, Laboratory work, Resource allocation, Secondary schools.*

1. INTRODUCTION

Education is a fundamental aspect of human society and plays a crucial role in the development of individuals, communities, and nations. It's a lifelong process that involves acquiring knowledge, skills, values, attitudes and it is essential for several reasons. Education provides individuals with the knowledge and skills necessary to achieve their goals, pursue their passions, and lead fulfilling lives. It helps individuals develop critical thinking, problem solving, and decision-making abilities, enabling them to navigate the complexities of life and make informed choices. It is closely linked to economic growth and productivity. It equips individuals with the knowledge and skills necessary to participate in the workforce, drive innovation, and contribute to the economy. Studies have shown that countries with higher levels of education tend to have higher levels of economic growth and development (MoE, 2010).

Ethiopia's education policy is outlined in the country's constitution and various government directives and regulations. The overarching goal of the education policy is to provide free and inclusive quality education to all Ethiopian children and youth, with the aim of achieving sustainable development and reducing poverty and improving the overall well-being of the population. In accordance with this, Ethiopia established the 1994 New Education and Training Policy (NETP), one of the aims of the Ethiopian Education Policy is to improve people's physical and mental potential as well as problem-solving abilities through increasing education for everyone. These abilities and talents were acquired in part through educating pupils in science (MoE, 2010).

Chemistry is a fundamental science that studies the structure, properties, composition, and behaviour of matter. It plays a crucial role in various aspects of human life, including medicine, materials science, environmental science, and energy production. Chemistry helps us understand the composition and properties of substances, which is essential for understanding the world around us. By studying chemistry, we can learn about the molecular structure of materials, the reactions that occur between substances, and the properties of different elements and compounds (Feyera Bayisa, 2014).

Practical activities in chemistry are essential for students to understand and apply the concepts and principles they learn in the classroom. Conducting experiments is a fundamental aspect of chemistry education. Experiments allow students to observe chemical reactions, test hypotheses, and develop a deeper understanding of chemical principles. Experiments can range from simple demonstrations, such as mixing two chemicals to observe a chemical reaction, to more complex experiments, such as synthesizing new compounds or analysing the composition of unknown substances. Laboratory work provides students with hands-on experience in conducting chemical experiments and analysing data. It helps students develop essential laboratory skills, such as measuring accurately, following safety protocols, and recording data (Dandis, 2022).

Implementing practical work in chemistry can be challenging due to safety concerns, limited resources, time constraints, and limited access to chemicals. To overcome these challenges, essential to prioritize safety, collaborate with other institutions, develop creative solutions, advocate for increased resources, and provide professional development opportunities for teachers (Lagarowitz *et.al*., 2022).

Teacher and student perceptions of laboratory work in chemistry can vary depending on several factors, including the individual's experience, educational background, and cultural context. Many teachers perceive laboratory work as an essential component of teaching chemistry, as it allows students to apply their knowledge of chemical principles to real-world scenarios. Teachers may also see laboratory work as a way to engage students and make chemistry more interactive and enjoyable. However, teachers may also perceive laboratory work as time-consuming and challenging to implement, as it requires planning, organizing, and supervising laboratory activities. Teachers may also have concerns related to safety, technique, and limited access to resources, such as laboratory equipment and chemicals (Mulukan Ayelew, 2014).

Many students perceive laboratory work as an exciting and engaging way to learn chemistry, as it allows them to observe chemical reactions, test hypotheses, and develop a deeper understanding of chemical principles and way to develop technical skills. However, students may also perceive laboratory work as potentially hazardous and may have concerns related to safety and limited access to resources. Students may also perceive laboratory work as time-

consuming and may have concerns related to the amount of time spent in the laboratory versus the amount of time spent in the classroom (Regan *et.al.*, 2021).

1.1. Statement of the Problem

The effective integration of practical activities in chemistry education is crucial for students to develop a deeper understanding of chemical concepts and principles. However, the perceived importance of laboratory work has been declining as science education has become more focused on theoretical and conceptual learning due to various factors, including changes in educational priorities, increased costs and complexity of laboratory equipment and materials, the availability of alternative learning resources. This shift has been driven by the need to prepare students for careers in research or academia, where laboratory work is less emphasized. As a result, science education has become more focused on understanding scientific concepts and theories, rather than hands-on laboratory experience. There are concerns among educators and researchers that teachers may not adequately implement practical activities due to various constraints, such as limited resources, time constraints, or a lack of training, lack of student engagement. Additionally, students may not fully engage in practical activities or may not see the relevance of these activities to their learning outcomes.The activity of his/her student in laboratory is low as a result. Low understanding of the chemistry subject often leads to an imaginative perception among students that chemistry is difficult to grasp, with particular concern about the impact of laboratory activities and finding chemistry concepts very complicated (Lagasse Abraham and Asfawu Antehun, 2011).

This study aims to explore the perceptions of both teachers and students regarding the implementation of practical activities in chemistry teaching and learning, with the goal of identifying factors that influence their attitudes and behaviours towards these activities. By understanding these perceptions, this study hopes to provide insights into strategies that can be implemented to improve the effectiveness of practical activities in chemistry education.

1.2. Objectives of the Study

1.2.1. General Objectives

The general objectives of this study were to examine the teacher and student perception toward practical activities implementation in chemistry teaching and learning in selected secondary schools in the West Showa Zone Walmara Woreda.

1.2.2. Specific Objectives

The following specific objectives guided the study;

- To assess the attitude of chemistry teachers in selected secondary schools in West Showa towards practical activities implementation in teaching.
- Evaluate the perception of secondary school students in West Showa Zone Walmara Woreda secondary school regarding the effectiveness and relevance of practical activities in chemistry learning.
- Find out the challenges and explore potential strategies for strengthening the practical activities into chemistry teaching in West Showa Zone Walmara Woreda.

1.3. Research Question

The following leading research questions have been proposed to guide the study's focus and direction. These are as follows:

- ✓ What are the attitudes of teachers toward practical activities implementation in chemistry teaching and learning?
- ✓ What are the perceptions of students in regarding the effectiveness and relevance of practical activities in chemistry learning?
- ✓ What are the challenges that affect the student and teacher perceptions toward practical activities implementation in chemistry teaching and learning?

1.4. Scope of the Study

The scope of the study was limited to the area of investigating the teachers, students and directors perceptions and practices of laboratory work in chemistry classes in all Secondary Schools (Kolobo, Talacho and Suba) of Walmara Woreda. The study focused on grade 9 and 10 students. This is because grade 9 and 10 are the stage at which the students join their

secondary school and have decision to focus on the area of their study. The study was conducted in Oromia, West Showa Zone, Walmara Woreda, which is far away about 35_km from capital city of the country, Addis Ababa.

1.5. Limitation of the Study

Different limitations hindered the progress of this research in the process of collecting data for instance; inconsistency on schedule, cost implication for the requirements, resources shortage of time to collect the data were the challenges the researcher faced when undertaking the study. However, the researcher would appoint the respondents frequently and showing the commitment to complete this study successfully.

1.6. Significance of the Study

This study can contribute to the existing body of knowledge by providing insights into how teachers and students perceive practical activities in chemistry classrooms. By understanding these perceptions, researchers can gain a better understanding of the effectiveness of practical activities in promoting student learning and engagement. The findings of this study can have practical implications for chemistry educators. If teachers and students perceive practical activities as valuable, educators may be more inclined to incorporate them into their teaching practices. Conversely, if perceptions are negative, educators may need to reassess their approach to practical activities. The study can also have theoretical implications for our understanding of how students learn science, particularly in the context of chemistry. If both teachers and students perceive practical activities as valuable, it could support the idea that hands-on experiences are essential for student understanding and retention of scientific concepts. The impact of practical activities in chemistry classrooms can have broader social and economic implications. If practical activities are perceived as valuable, it could lead to an increase in the number of students pursuing careers in science, technology, engineering, and mathematics. This, in turn, could contribute to economic growth and innovation.

Furthermore, the findings of this study can inform future researchers could explore the specific types of practical activities that are most effective in promoting student learning and engagement. Additionally, researchers could investigate how perceptions of practical activities vary across different educational settings, such as urban versus rural schools or schools with different socioeconomic profiles.

2. LITERATURE REVIEW

2.1. Introduction of the Laboratory

For more than 100 years, laboratories have been employed for teaching and learning in the natural science disciplines. A laboratory experience has been found to promote problem-solving abilities, intellectual development, scientific thinking, and practical skills. Laboratory work should achieve enhancing mastery of subject matter, developing scientific reasoning, understanding the complexity and ambiguity of empirical work, developing practical skills, understanding the nature of science, cultivating interest in science and interest in learning science, and developing teamwork abilities (Hodson, 2014).

The laboratory activities have an important and central role in the science curriculum. The courses in laboratory put forward students the occasion to gain manipulative skills, observational skills, and the ability to plan experiments and to interpret experimental data. The significant role of laboratory work is to help students to make links between two domains of knowledge: the domain of objects, observables and the domain of ideas. Therefore, learners can perform the experiments effectively at two levels: at the “doing” level and at the “learning” level. Consequently, they need to have a variety of skills at both levels to experiment successfully. The “doing” level focuses on manipulative skills and observational skills whereas the “learning” level focuses on the ability to interpret experimental data and to plan experiments. In addition, practical work promotes further aims, for example interest development, personality development, and enhancement of social competence (Hofstein and Lunetta, 2004).

Practical work or laboratory work is taken to mean those activities carried out by the teacher, the teacher and the students or the students on their own in order to accomplish experiments or demonstrate scientific phenomenon. For science, practical work can be carried out inside or outside the laboratory or classroom. There is physical manipulation of apparatus, objects and materials during an activity. Because of the manipulation, the object or material must be able to reveal some observable phenomenon. Basically, observation and experiment are the key in science practical work (Bernhard, 2018).

In a reviews of research on laboratory work, (Hancock, 2008) points out that the questions underlying many studies imply uncertainties about the instructional role of laboratory work at the secondary school level. Writing on practical work objectives, summarizes attempts that have been made at producing statements of practical work objectives. Practical work aim/objective is an intended outcome after a suitable practical course or experiment has been done (Osborne, 2000). The intended outcomes include psychomotor, cognitive and affective domains of educational objectives. Consideration of the history of the development of practical work objectives in the 1940's and 50's reveals that in many parts of the world, the principal aim of teaching chemistry was direct recall of factual knowledge (Agogo *et al*., 2014). During the 1960's and 70's there was shift in emphasis from simple acquisition of knowledge to a desire to develop process skills in students (Agogo *et al*., 2013). Practical work in science was seen as important in developing the skills and techniques of scientific inquiry (practical skills). Practical skills are mainly manipulative skills; appropriate abilities (cognitive and psychomotor) which students should possess because of doing experiments or in order for them to complete experiments. The practical skill is mastered through repetition of practical tasks (Tatli, 2013).

2.2. Laboratory as an Excellent Environment for Active Learning

The laboratory should help the students develop a broad array of basic skills and tools of experimental sciences and data analysis. While it is imperative that students have a broad experience with techniques using laboratory equipment, it is impossible to prescribe precisely which equipment should be used in all science laboratories. At the same time, it is advisable to allow students to make the use of many different types of laboratory apparatus to make observations. The laboratory should help students master basic science concepts. A growing body of research in science education indicates that a majority of students have difficulty in learning basic physical concepts in a course built around conventional teaching methods, textbook problems, and verification of experiments. These studies indicate that to improve learning, students must actively confront difficult concepts (Zakiah, 2015).

In 1807, Thomas Thomson established the first chemistry-teaching laboratory in the United Kingdom at the University of Edinburgh. He joins the University of Glasgow in 1819 and introduces technology to the university. At the University of Giessen, Liebig established a

chemistry laboratory. Since that time, practical work was regard as an essential fulfillment for science teaching after the gradual development of laboratory work in most countries. Laboratories in the world of education are places where the teaching and learning process through demonstration or practical methods can produce learning experiences where students interact with various tools and materials to observe changes that occur due to chemical reactions. In doing practicum, students can work individually or in groups (Agwai, 2008).

The scientific community continues to give conflicting impressions about the contribution of laboratory activities to science learning and yet ignores the views of students who are the focus of learning (Ampiah, 2001). Science theories are mastered in practice in teaching and learning activities. Teaching and learning through practical work are among methods that undoubtedly facilitate knowledge transfer and skills acquisition in teaching and learning events. Various approaches to science laboratory instruction are found in the literature: inquiry-based learning, teaching for scientific practices, teaching for scientific competencies, and expository approaches (Draphor, 1994).

Laboratory-based learning produces new types of knowledge and competency for people. The multifarious materials of the laboratory environment and its components constituted a counterpoint to the idealism of scientific insights, categories and values, and the increasingly divided nature of the research process contrasted with the ascription of discoveries and achievements to individuals not only on the level of individual people but also on the level of nations. Laboratory classes comprise experiments that accompany the lecture and discussion portions of science courses. Although the value of laboratory classes has been questioned recently sometimes because there is little evidence of their impact on student learning, certain values of teaching and learning are based on the importance of practical works (Mailumo et al., 2009). The laboratory environment allows students to gain a first-hand experience with course concepts and further provides them with the opportunity to explore methods used by scientists in their discipline. The laboratory learning environment has largely been reported in the literature to depict an apprenticeship model, where learners follow a step-by-step procedure after their laboratory instructor or a laboratory manual (Feyzioglu, 2011).

2.3. Practical Work in Chemistry

The subjects of chemistry are important fields of science that examine the structure of matter, composition, properties, and the interaction between elements. They enable learners to understand what happens around them. However, they are considered difficult subjects to learn due to the great amount of information needed about materials and their properties, which might discourage learners from studying these subjects. To understand the properties of all materials and the changes that take place when they interact, many practical applications and experiments must take place in the course of studying these challenging subjects (Choi, 2013).

2.4. The Students Perceptions of Chemistry Laboratory Work

There have been many studies that have looked into students' perceptions towards science and how they perceive science in comparison to other issues and subjects Millar(2000) Yet, in reviewing the literature surrounding students' perceptions on the nature and purpose of practical work, what is reflected is how there is no research specifically, into what, and why, students think and feel about practical work as well as whether practical work has an affective value in influencing students' decision to continue with science post compulsion. It appears that teachers, as shown through the vast amount of empirical data see laboratory work as motivating. However, there is a need to ask students direct questions regarding their affection to practical work, such as "do they enjoy practical work? Does it motivate them?(George, 1998).

The House of Commons (2002) reported that students perceived laboratory work as a helpful way of linking theory and practical knowledge as well as providing the manipulative skills. Such aims are similar to those that explain effective practical work can achieve. In reality of course, the report observed that not all students enjoyed, or were motivated by, practical work, some students commented that a better range of practical work approaches was needed, helping students to experiment and investigate more (Mahajan and Singh, 2005). In addition, students found a problem in achieving the desired result and for some there was disaffection in carrying out practical work that was merely in a recipe style or where they already knew the result. Science Community Representing Education (2007) Students view laboratory work

rather negatively but suggested that students should have a variety of exciting opportunities to experiment and investigate.

Regardless of the apparent flaws noted by the students themselves at the time, it appeared that laboratory work was still seen as a major affective part of science by teachers. There have been suggestions of the many factors that influence students decisions to continue with science subjects, such as: future career or university aspirations, the value students and parents place on the relevance of the subject to the students' life, the traits of the individual teacher, and other members of staff that impact on students' learning of science (Wellington, 1998). Cleaves (2005) also found that whilst many students claimed to enjoy practical work, there was widespread criticism that there was less time devoted to conducting practical work in science lessons as they progressed through the schooling system. It therefore seems that even though students wish to conduct more practical work, possibly because they enjoy it over other methods of learning science, they do not feel that what is taught in their classes is the best that it could be. Moreover, this is an influential finding considering the nature of the students involved were higher ability students, because despite their concerns about practical work some of them are still opting to study science post compulsion. The implications of the use of practical work on lower ability and disaffected students in science may influence them to hold a slightly less negative image of science (Motlhabane, 2013).

According to Bekalo and Welford (1999) the majority of students expressed highly positive feelings towards laboratory work in school chemistry. The students thought that practical work is important to their developing of understanding of concept being taught. According to Hodson (1996) Practical works reduced boredom. The students therefore see practical work as an enjoyment activity; one that relieves the boredom of a lesser and improves the mastery of new concepts. According to Hofstein *et al.* (2007) most students complained that laboratory work lacked coherence or continuity and may be expressed less than ideal science teaching. In that connection the students preferred laboratory activities help the students to remember, are less confusing and more concrete than other and that makes students think about the phenomena they are observing. Teachers preserve practical work as an effective way to learn science. Accordingly, lower ability students tended to lose think of experiments create equipment and disregard safety procedures.

2.5. The Teachers Perceptions of Chemistry Laboratory Work

Some educational researchers have noticed that teachers are surprised when asked to consider the purpose of practical work in school science (Domin, 1999). Perhaps the fact teachers are not thinking about the reasons for the implementation of practical work would explain for the appeared confusion. Such an issue also places uncertainty on the reliability of their perceptions within studies relating to perceptions of the purpose of practical work. Certainly, Shiland (1999) justifies a variety of factors from personal to societal issues (relating mainly within their respective schools) for how teachers' perceptions of practical work are formed. According to Adedayo and Julius (2015) teachers' perceptions on practical work differ according to their opinion of "fairness" within education. The findings showed that "teachers holding perceptions of fairness in the context of providing students with an all-round education and/or providing students with the chance to learn the subject matter" were inclined to view practical work as a means of "developing students' affective / cognitive/ motor skills". Yet, teachers appear drawn between two perceptions of practical work- motivating students and providing the skills for continuation in science and meeting the needs of the practical examinations. Although the key to better practical work, in meeting the effective and affective claims, does not come solely from "doing more practical work, but of doing better practical work". It appears that the research carried out into teachers' perceptions of practical work have primarily focused on teachers arranging aims in rank order of importance (Dahar, 2011).

2.6. The Role of Laboratory Work in Teaching and Learning of Science Subjects

Science is different from other disciplines by its processes, which are observations, classification, measurement, prediction, problem identification, collection, analysis and interpretation of data, drawing conclusion and experimentation. Laboratory work plays an important role in teaching and learning science. Apart from helping students to gain insights into scientific knowledge, it also helps them to acquire a number of scientific skills, namely cognitive and manipulative, and not to mention motivational factors it creates in the student. The attainment of these goals, however, depends on the way practical work is organized (Jonassen, 1991).

2.7. Laboratory Adequacy and Students' Achievement in Chemistry

Laboratories provide a real-world atmosphere and procedures, which are defined as an academic setting in which students use experiments to translate their theoretical knowledge into practical knowledge. Laboratories allow students to engage in meaningful virtual experiences while also introducing them to crucial concepts, principles, and procedures. Student can use virtual laboratories to replicate any incorrect experiments or to delve further into the desired experiences. Furthermore, the participatory character of such teaching creates s an academic setting that is both clear and pleasant (Feyera Bayisa, 2014).

2.8. Outcomes of Laboratory Education

The goals of laboratory instruction in chemistry can be broken down into four categories: learning technical skills, increasing conceptual knowledge, gaining positive attitudes toward chemistry, and developing skills related to the process of scientific inquiry. One of the early goals of laboratory instruction was teaching students technical bench skills that they could use in the workforce. Although presently most students who take general chemistry will not go on to become chemists, practicing laboratory skills and techniques continues to be a major goal of laboratory instruction (Dahar, 2011).

Several studies have demonstrated that participating in laboratory activities increases students' ability to perform manipulative skills relative to demonstrations or to watching filmed experiments. Some argue that learning skills is important not just for the sake of gaining proficiency with laboratory skills, but because students need to understand laboratory techniques in order to perform investigations. Since time in the laboratory is limited, students should learn techniques that they will perform in multiple experiments or techniques that will be important in future courses or their careers (Motlhabane , 2013).

2.9. Common Challenges of Laboratory Practice

Teaching and learning process of laboratory practical in science was not an easy task. For one thing, the misconceptions of students in science devotes the energy; on the other hand, lack of laboratory experience, exposure and science process skills hinders students from attaining the objectives of laboratory practical designed. Allanas (2021) explained in their study that although laboratory practices enhance the students' learning experience, it has been criticized

for the fact that it is unproductive and confusing unless clear thought used. Hence poorly involved and experienced students developed poor or no experience of laboratory management even for highly expensive chemicals and apparatus. This is due to lack of well-organized laboratory, large class size, students science background, proximity of practical and theoretical class, availability of standardized laboratory books and poor skills of application of IT for laboratory practical (Mailumo *et al.*, 2009).

3. RESEARCH METHODOLOGY

3.1. Description of the Study Area

Walmara is one of the Woreda found in the West Showa Zone in the Oromia region of Ethiopia, its geogr**a**phical coordinates are latitude and longitude of 9°45'0" North and 38°15'0" East and it is bordered on the south by the Sebeta Hawas, on the west by Ejere, on the north by Mulo, on the northeast by the Sululta, and on the east by the Burayu. Towns in Walmara include Kolobo. It is located 35 km far from capital city, Addis Ababa in the west direction along the main road to Ambo.

3.2. Research Design

To achieve the intended objectives of the study descriptive survey design were used. The objectives of this study were to investigate the student and teacher perception and practices of laboratory work in chemistry classes of secondary schools in the West Showa Zone in some selected secondary schools of Walmara woreda. Descriptive research methods focus on investigating the issues and practices by including the large size of the population. To conduct this research, both qualitative and quantitative data was used.

3.3. Population of the Study

The populations of the study were three secondary schools of Walmara woreda. Three respondent groups are used for this study purpose, chemistry teachers, director and students. For this specific research, the following sampling was selected from Walmara woreda secondary schools in general with the 1050 total population of students. Among this population 289 students were selected by stratified sampling techniques. To determine the sample size, slovin's formula was selected in order to limit the sample size of the study. Accordingly, 289 students are selected.

That is: - $n=\frac{N}{1+Ne^2}$ Use confidence level 95%, Margin of error = 0.05 Where;

$n=\frac{1050}{1+1050(0.05)^2}$ N= the population size

$n=\frac{1050}{3.625}$ e= the margin of error

n=289 n= the sample size

Students from each secondary school were also taken for the study by using random sampling. From the sampled general secondary schools, the researcher took all Chemistry teachers and directors (100%) obtained the relevant information available for study. The population and the sample selected from secondary schools are in the following table.

Table 3.1: Name of schools and the number of respective directors, teachers and students who respond to the questionnaire and interview

No	Name of School	Teachers		Students		Directors
		Population	Sample	Population	Sample	
1	Kolobo Secondary School	4	4	600	165	1
2	Talacho Secondary School	4	4	250	69	1
3	Suba Secondary School	4	4	200	55	1
	Total	12	12	1050	289	3

3.4. Sampling and Sampling Procedures

The total respondent of the study were 289 students, 12 Chemistry teachers and 3 directors found in three Walmara woreda secondary schools, namely Kolobo, Talacho and Suba secondary schools. Random sampling techniques were used for students to get the representative or the participant of the study and purposive sampling techniques were used for teachers and directors, to limit the sample size of the study slovin's formula was selected.

3.5. Source of Data

The researcher was used only primary data to gather information from the specified population to conduct the study. Primary sources of data will be:

- Questionnaire
- Interview will be used in these study
- Observation and

3.5.1. Questionnaire

Self-developed questionnaire was prepared in English language and distributed to teachers and validated instruments were developed as follows: before the actual data collection was start; the instruments were given to colleagues to get valuable comments and criticisms on the strengths and weaknesses of the items. Based on the comments obtained, necessary modifications were made and given to the thesis advisor for further comments, criticisms and evaluation.

3.5.2. Observation

Observation is the method to gather information relevant to the study desirable part of data gathering instrument. For the purpose of observation, checklist was employ. Accordingly, the three-selected school was observed three times each. Hence, nine observations were marked using the checklist developed for the purpose.

3.5.3. Interview

Semi-structured interview were conducted with 12 chemistry teachers and 3 directors of the school prior to each interview; a schedule was prepared with suggested questions. The location for an interview was organized in advance and in a quiet place so that the interviewee can concentrate on the questions but also in an open place where neither the researcher nor the interviewee can be compromised.

3.6. Data Collection Procedures

To collect the necessary data, the researcher followed the following procedures. First questionnaires, interview questions and checklists for observation were prepared. The researcher contacted the concerned bodies or respondents. Following this activity, the researcher distributed a self-developed standardized questionnaire for students and chemistry teachers. The distribution continuously follows up and the collection of questionnaire was made by the researcher himself and timely collect back to minimize unreturned questionnaires or leftover.

3.7. Data Validation

Validity refers to the quality that a procedure or an instrument (tool) used in the research is accurate, correct, true, meaningful and right. Validity therefore, implies what we want to obtain and what we are supposed to measure. For this study, different sources of data would be employed. The instrument used to collect data for this study would be validated by advisor, and senior science teachers in Kolobo, Talacho and Suba secondary schools. The correction and suggestion made would strictly adhere before producing the final copy of the instrument. The data were cross-referenced and cross-validated to check the validity of study using these various data sources.

3.8. Statistical of Data Analysis

In this section, all information were obtained from questionnaire for teachers and students, interview for Chemistry teachers, school director and observation checklist were analyzed. Frequency count and percentage was statistical method used to analyze and present the structured data items of the questionnaires collected from 12 Chemistry teachers and 289 students and Observation made quantitatively. In this study, both qualitative and quantitative method of data analyzing was used. The data gather from respondents through data collection tools analyze by using Microsoft excel in data table.

3.9. Ethical Consideration

In this study, special emphasis would be given to ethical consideration. Attempts were made to make the research process professional as well as ethical. The resources that used in this research were acknowledged properly. The participant's consent to participate in the research is voluntary, free of any coercion or promises of benefits. Respecting the ideas of all the participant individuals, was given due consideration. Clarity, truthiness and acknowledgment of others ideas and comments in the process of the successful accomplishment of this paper were given special attention throughout the works of the study.

4. RESULTS AND DISCUSSION

4.1. The Perception of Students and Teachers in Laboratory Work

4.1.1. The Perception of Students

Responses to questionnaires from students about their perceptions of laboratory work were calculated. Some items were included in the survey questionnaire to determine whether respondents had complaints. According to the survey results, there are some issues with the chemistry laboratory experiments that are available. The responses of the students are shown in Table 4.1.

Table 4.1**:** Student response on their perception of laboratory work

No	Item	Strongly Agree		Agree		Undecided		Disagree		Strongly Disagree	
		F	%	F	%	F	%	F	%	F	%
1.	I believe those teaching theories alone are enough to develop students' knowledge of chemistry	25	6.4	29	7.4	25	6.4	119	48.9	91	30.7
2.	Teaching must prepare students for laboratory activities	115	42.3	111	41.3	31	9	23	5.4	9	1.8
3.	Except for repeating procedures given in manuals, no new knowledge can be learned in laboratory work	15	5.2	23	8.0	45	15.6	166	57.4	40	13.8
4.	I feel fear thinking that many of the chemicals used in the experiments may cause health hazards to me	67	23.2	114	39.4	41	14.2	31	10.7	36	12.5
5.	Laboratory work is not economical to use in teaching learning.	55	19.0	82	28.4	63	21.8	79	27.3	10	3.5

As a result, study participants were asked to provide information on the significance of chemistry practical courses offered to them. According to the results, the majority of students responded that the chemistry practical courses (experiments) are relevant to them. For

example, students were asked if they believe that theories alone are sufficient to develop their knowledge of chemistry (item 1).

As a result, the majority (48.9%) disagreed and 30.7% strongly disagreed with the idea. They were also asked teaching should prepare students for laboratory activities (item 2). As a result, most of the majority of students (42.3%) strongly agreed, and 41.3% agreed. Because laboratory work is essential for student learning, teachers should encourage students to actively participate in laboratory activities. The remaining item groups (3–5) were designed to elicit students' perceptions of the qualities of laboratory activities. As a result, for all items 3 and 5 the majority of the students (54.7%, 27.3%, respectively) disagreed with the idea that the activities are relevant to the student learning. However, for item 4, the majority (39.4%) of students agree that they are afraid because many of the chemicals used in the experiments may pose a health risk.

The findings of this study agreed with Abraham Lagasse and Asfawu Antehun (2011) finding that a survey of students' opinions on the relevance of chemistry laboratory experiments offered in Jimma University's Chemistry Department revealed that the majority of students believe chemistry laboratory classes are relevant and beneficial to their learning.

Subject to presentations regarding research findings about the attitudes of students and their performance in chemistry, it was found that the students at fields toward chemistry subjects were closely related. Specifically poor performance in chemistry subjects tends to be associated with students who had a negative attitude towards chemistry subject. Indeed, the findings of Adedayo and Julius (2015) are shown that positive attitudes towards any subject facilitated good performance of students and this clearly indicated that those students who had positive feelings and inductions towards sciences worked hard to achieve the best out of them. Despite the hardship in overcoming the scarcity of practical equipment, textbooks and other factors such students seem to utilize their teachers because of the interest they had for the subject, such students appreciated the weed to settle and concentrate to attain better results. Negassa Olana (2014) who pointed out did more work on this that academic effort must develop among the people faced with a problem, where they need to have the attitude and interest of working together; interact intensively in order to find solutions to such problems.

Students in current study schools were deprived of such opportunities because of the following hindering factors, which makes negative impact on students' preference to chemistry education: The absence of separate well-equipped laboratory in each school under study, the absence of laboratory technician for each science in the school, who can carefully facilitate and lead the laboratory procedure, absence of well-prepared laboratory manuals like chemicals, apparatus and laboratory room give less function for the fact that the chemicals on the laboratory are highly expired and outdated, and dangerous for the students. The laboratory room does not match with the number of students. Some schools do not have totally laboratory rooms and even those which are available not suitable for work.

General secondary school is the base in preparing students for science and technology education and it is at this level where they were exposed to laboratories equipment, activities and precaution or safety rules. If there is no practice either individually or in a group, all what have been learnt become inert knowledge.

4.1.2. The Perception of Teachers

Teachers play great roles in the effective implementation of laboratory activities. Hence, they are asked different questions regarding their views on the relevance of laboratory activities and their qualities. The teachers were asked about their beliefs were asked whether laboratory work is good in theory although it is difficult to carry out effective laboratory work in reality (item 7). Consequently, the majority (41.6%) of the teachers strongly agreed and 33.3% of them agreed with the statement. Laboratory work is important to students' learning, so teachers should motivate students to actively participate in the laboratory activities. Accordingly, the teachers' response was given in Table 4.2.

Table 4.2: Teacher response on their perception of laboratory work

No	Item	Strongly Agree		Agree		Undecided		Disagree		Strongly Disagree	
		F	%	F	%	F	%	F	%	F	%
1.	Most of the activities are not relevant	-	-	1	8.3	-	-	7	58.3	4	33.3
2.	I believe that teachers must encourage students to participate actively in laboratory activities	9	75	1	8.3	1	8.3	-	-	1	8.3
3.	I know that laboratory work adds a workload on teachers	-	-	6	50	-	-	6	50	-	-
4.	In using laboratory work, teachers find it difficult to cover the prescribed syllabus	1	8.3	4	33.3	-	-	6	50	1	8.3
5.	Laboratory activities waste a lot of students' time, and most of the activities are teacher-centered	-	-	1	8.3	2	16.6	5	41.6	2	16.6
6.	The results of the experiments are predetermined and do not motivate students	-	-	-	-	-	-	6	50	6	50
7.	Laboratory works are good in theory, but in reality, it is difficult to carry out effective laboratory work	5	41.6	4	33.3	1	8.3	2	16.6	-	-

Therefore, teachers were asked about their beliefs on whether teachers must encourage students to participate actively in laboratory activities (item 2). As a result, the majority (75%) of the teachers strongly agreed with the idea. The activities were whether laboratory work adds workload on teachers (item 3), and makes teachers find it difficult to cover the prescribed syllabus (item 4). Therefore, for items 3, and 4, the majority (50%, and 50%, respectively) of the teachers disagree with the ideas.

Teachers were also interviewed to obtain their opinions on laboratory work. During the interviews, the participant teachers were also asked: ***laboratory work makes students love the subject matter****?*. The respondents mentioned said, ***Laboratory work provides students additional knowledge and it makes students create something new, as well as laboratory work makes the lesson unforgettable and tangible to students***. In addition, ***it makes everything clear to the students***. For example, one of the teachers said, *the practical part of the lesson helps students not forget the lesson and it motivates us for further practical investigation. He adds that it helps students to develop more knowledge*. Similarly, another teacher responded: .*The laboratory supports the theoretical part of the lesson, so it helps us to understand the lesson easily.*

Chemistry teachers were also very vital in influencing their students to develop an attitude towards their subjects, they ought to share the blame too, this was because the results indicated that most teachers had low level of education and on the opinion of the students, majority said that they faced difficulties in sciences due to the methods employed by teachers in teaching lessons. Although it was difficult for the school administration to correct this problem immediately due to the scarcity of chemistry teachers those who at the present should try to spare most of their time in schools to make science subjects enjoyable by availing themselves to their students for guidance and consultation in academic matters.

The chemistry teacher in the each study school reported that even though they have positive attitude to practical activities, even in the absence of laboratory facility, less motivation of school principals to fulfill laboratory facility and environmental condition makes them not implement practical activities in science teaching.

4.2. The Practice of Laboratory Work

4.2.1. Student Response to the Practice of Laboratory Work

One of the objectives of this study was to find out whether laboratory activities are practiced in chemistry classes. Thus, the students were asked different questions that could show whether these activities are practiced in the teaching and learning process. The result is presented and discussed in Table 4.3.

Table 4.3: Student Response to the Practice of Laboratory Work

No	Item	Always=5		Often=4		Sometimes=3		Rarely=2		Never=1	
		F	%	F	%	F	%	F	%	F	%
1.	How often do you practice laboratory **a**ctivities	7	2.4	59	20.4	51	17.6	101	34.9	71	24.6
2.	I participate actively in the laboratory session	69	23.9	67	23.2	71	24.6	45	15.6	37	12.8
3.	Laboratory work makes us responsible for our own learning	166	57.4	45	15.6	40	13.8	23	8.0	15	5.2
4.	Laboratory work requires a lot of time	114	39.4	67	23.2	41	14.2	31	10.7	36	12.5
5.	In the report, we write exactly what the teacher tells us	82	28.4	79	27.3	63	21.8	55	19.0	10	3.5

Analysis of students' responses (Table 4.3) revealed that chemistry laboratory (practical) work was rarely practiced in schools. For instance, items 1 require students' opinions on whether laboratory work is practiced and, participate actively in the laboratory session respectively. Hence, items, the majority (34.9%) of the students responded that it was rarely practiced. Items 2 require students' responses to their level of participation in the laboratory (practical) work. Thus, the majority (23.9%) of the students responded that they participated actively in laboratory activities. Item 3 was whether laboratory work makes students responsible for their learning. Thus, the majority (57.4%) of them responded that it always makes them responsible for their learning. Consequently, the majority (39.4 %) of the students replied always. Item 5 was if students write reports exactly what the teacher tells them. Hence, the majority (28.4%) of the students replied that they always write reports exactly as the teacher tells them.

The study revealed that students have interest to learn practical activities. This is indifferent from the study conducted by Negassa Olana (2014) in which the students were not interested to conduct practical activities. But the less admission and participation of students to

science education result from assumption that less or absence of any practical activity in science subjects due to laboratory facilities have influence on their score in science and their future study.

Students' interest and their academic achievement in science education have direct relation and as the same time affective practices of students in classroom are strongly related to their academic achievement Mailumo *et al*. (2009) Students are effectively successful through practicing the subject matters. Millar (2000) 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 and learning of science students so as to get better achievement. Laboratories have multiple benefits ranging from making learning concrete to lying basis for science education in the subsequent levels Gudyanga (2019) each schools laboratory is not equipped and chemicals which are even important to small extent are missing. In all schools there is no facility except Kolobo secondary schools in which there are some facilities but laboratories are not functional and equipment's and chemicals are simply stored in non-ventilated store due to absence of skilled laboratory technicians and safe storage system.

4.2.2. Teachers' Response to the Practice of Laboratory Work

Teachers were also asked different questions that indicate the practice of chemistry laboratory work. The responses are given in Table 4.4.

Analysis of teachers' responses (Table 4.4) revealed that chemistry laboratory (practical) work was rarely practiced in schools. For example, for item 1, half (50%) of the teachers responded that laboratory work was rarely practiced in the schools. Item 2 requires teachers' responses on their level of participation in the laboratory (practical) work. As a result, more than half (58.3%) of the teachers responded that they participated actively in laboratory activities. In addition, teachers were asked whether they had experience in laboratory work, item 5, so half (50%) of the teachers replied that they sometimes had such an experience.

Table 4.4: Teacher response to the Practice of Laboratory Work

No	Item	Always=5		Often=4		Sometimes=3		Rarely=2		Never=1	
		F	%	F	%	F	%	F	%	F	%
1.	Laboratory work is practiced in chemistry classes	-	-	4	33.3	2	16.6	6	50	-	-
2.	Teachers participate actively in the laboratory work	7	58.3	4	33.3	1	8.3	-	-	-	-
3.	The implementation of laboratory work requires well-trained teachers	9	75	3	25	-	-	-	-	-	-
4.	Encourage students to comment on the results and discuss how it can be improved	2	16.6	4	33.3	2	16.6	1	8.2	3	25
5.	I had experience of laboratory work	-	-	3	25	6	50	3	25	-	-

On the other hand, teachers were asked (Item 3) if the implementation of laboratory work requires well trained teachers. Therefore, most (75%) of the teachers replied always. Item 4 was whether teachers made students comment on the laboratory results and discussed how they can be improved. Therefore, the majority (33.3%) of the teachers responded that they often did such an activity.

4.2.3. Presentation and Analysis of Data Obtained Through Observation

Data obtained from classroom observation proved that there was not enough sitting space for all students to implement laboratory work.

Table 4.5: Condition of the laboratory room

No	Item	Yes		No	
		F	%	F	%
1.	There are enough sitting spaces for all students	-	-	9	100
2.	The seats are comfortable to do laboratory activities	2	22.2	7	77.8
3.	The classroom layout is arranged to facilitate laboratory work	1	11.1	8	88.9
4.	There is sufficient laboratory equipment (chemicals and instruments) in the laboratory class	-	-	9	100
5.	There are sufficient windows of hoods (air inlet and outlet space) in the laboratory class	-	-	9	100

Accordingly, 100% of the data shows that the seating space was not suitable for laboratory work. In addition to the lack of enough sitting space for all students to implement laboratory work, most (77.8%) of the observed data showed that the seats were not comfortable for laboratory work. Similarly, most (88.9%) of the data indicated that the layout of the classroom was not arranged to facilitate laboratory work. Moreover, 100% of the observed data showed that there were no sufficient laboratory types of equipment (chemicals and instruments) in the laboratory classes.

Teachers are expected to give different activities to students in laboratory work. Therefore, the classroom observation checklist contained some of the possible activities of teachers. Results of the observed data are given in Table 4.6.

Table 4.6: Teachers activities

No	Item	Yes		No	
		F	%	F	%
1.	Arranging students for different laboratory activities	2	22.2	7	77.8
2.	Giving direction about the procedures of the laboratory Activities	9	100	-	-
3.	Giving directions about how to write reports	7	77.8	2	22.2
4.	The teacher is active in explaining, monitoring and describing activities	9	100	-	-
5.	The teacher gives activities to the students	3	33.3	6	66.7
6.	The teacher asks questions to the students	9	100	-	-
7.	The teacher follows up students' activities and their participation in the laboratory work	4	44.4	5	55.55
8.	The teacher evaluates students cooperation in the laboratory work	2	22.2	7	77.8
9.	The teacher checks and gives constructive feedback on the students' laboratory activities	5	55.55	4	44.4

As in Table 4.6, the classroom observation result indicates that teachers provided some activities for students to do but not others. For instance, for items 1, 5, 7, and 8, majorities of the observed data indicated that the teachers did not do such activities in the laboratory classes. The questions were whether the teachers arrange students for different laboratory activities (item 1), provide activities to the students (item 5), follow the activities and their participation in the laboratory work (item 7), and evaluate the cooperation in the laboratory work (item 8), and check and give constructive feedback to the students (item 9). Consequently, 77.8%, 66.7%, 55.5%, 77.8%, and 44.4%, respectively, of the teachers did not provide such activities. However, the teachers did some activities. For example, the majority

of the observed classes showed that the teachers give directions about the procedures of the laboratory activities (item 2) and how to write reports (item 3). Hence, 100% and 77.8%, respectively, of the data indicated that the teacher did such activities. The observed data also showed that 100% of the teachers were active in explaining, monitoring, and describing activities (item 4) and asked questions to the students (item 6).

Table 4.7: Student activities

No	Item	Yes		No	
		F	%	F	%
1.	Students are active in participating in the laboratory activities	5	55.5	4	44.4
2.	Each student is playing role in the group discussion	-	-	9	100

As in Table 4.7, although the classroom observation result indicates that (55.5%) of the students were active in participating in the laboratory activities, 100% of the data showed that each student does not play a role in the group discussion.

4.3. Factors Affecting the Practice of Laboratory Work

Different factors can affect the implementation of laboratory work. As discussed in the review of the literature, the factors could be teacher-related, student-related, or materials and facilities related. Therefore, one of the objectives of the research was to identify the factors affecting the implementation of laboratory work. In Table 4.8 and 4.9 areas are identified and presented for the students and teacher to express their ideas on the extent of the influence on the practice of laboratory work. They selected the factors as most serious, serious, undecided, or not serious.

Teachers were also asked about the factors influencing the implementation of laboratory work in the teaching learning of chemistry. During the interviews, the participant teachers were also asked: *What problems do you experience regarding the implementation of laboratory work?* One of the teachers, for example, mentioned: "*The main problem is the lack of resources, and some students lack interest, so they are not engaged in laboratory activities". Similarly, another teacher explained: "For me, it is difficult to practice*

experiments in contexts where there are not enough resources"). During the interviews, the participant *directors* were also asked: *What was the condition of chemical laboratory facilities, state of the equipment and materials in schools?*

"*For our school chemistry lab facilities still incomplete, it can be seen from the laboratory supporting facilities like chairs that are still less by the number of students and not in accordance with existing standards*" and also asked: Do you frequent monitoring of the activities in the school chemistry lab father? Directors say that: "*For monitoring all activities in school laboratories, has been given authority to the head of the laboratory, and if there are constraints on the implementation of a laboratory, then the head of the lab report to the principal*". Teacher also asked:

Is the chemistry subject teachers received training in the laboratory? Teacher is mention: "*Never, but it's been so long. This is one of the problems that make teachers less motivated in practical implementation by the government due to lack of training for teachers about the laboratory"*

Table 4.8: Teachers' response to possible factors that affect the implementation of laboratory Work

No;	Item	Strongly Agree		Agree		Undecided		Disagree		Strongly disagree	
		F	%	F	%	F	%	F	%	F	%
1	Practical activities specified in science curriculum are the important part of the curriculum that should be implemented	9	75	3	25	-	-	-	-	-	-
2	It is impossible to perform practical activities in the absence of well-equipped laboratory	10	83	2	17	-	-	-	-	-	-
3	There are trainings organized by administration bodies (Woreda, zone, regional, MoE) that enable science teachers to implement the laboratory work	-	-	-	-	-	-	-	-	12	100
4	We have well equipped science laboratory in our school	-	-	-	-	-	-	3	25	9	75
5	Our class room condition(transparency, arrangement, class size) is conducive for demonstration of some practical activities	-	-	2	16	-	-	7	58	3	25
6	There are supports from education offices (Woreda, zone, regional, MOE) to facilitate for the implementation practical activities	-	-	2	16	-	-	2	16	8	67
7	Lack of resources	12	100	-	-	-	-	-	-	-	-
8	There is skilled laboratory technician in chemistry to assist of laboratory work	-	-	-	-	-	-	2	16	10	83

Table 4.8 has dictated conditions that directly or indirectly affect the implementation of laboratory work in secondary schools. All the teachers believe that practical activities are the important part of the curriculum that should be implemented. However,they believe the presence of well-equipped laboratory for the implementation. The responses to question No 3 and 8 indicate there are no professional supports as well as no laboratory technician to enhance practice of practical activities. The responses to item No 6 also indicate least effort by education offices to facilitate the schools environment for the implementation of science practical activities. These results are in agreement with the findings from interview with principals and observation checklists for school facilities.

Table 4.9: Students' response on factors affecting the implementation of laboratory work

No. Item	Most Serious		Serious		Undecided		Not serious	
	F	%	F	%	F	%	F	%
1.Shortage of time to practice laboratory work	130	40.3	104	33	19	11.1	36	15.5
2.Students' lack of interest in laboratory work	139	42.6	59	21.4	38	16	53	19.9
3.Students' knowledge of laboratory Work	110	35.1	99	31.7	50	19.1	30	13.9
4.Teachers' knowledge of laboratory work	85	28.6	68	23.7	63	22.4	73	25
5.Some students' dominance during laboratory work	93	30.7	84	27.9	40	16.5	79	13.9
6.Lack of involvement of students in the laboratory activities	116	36.1	102	32.5	41	16.7	30	13.9
7.Lack of resources	214	62	37	15.7	14	9.8	24	12.4

As Table 4.9 shows, the most serious factors affecting the implementation of laboratory work in chemistry classes include lack of resources (62%), lack of interest in laboratory work (42.6%), lack of time to practice laboratory work (40.3%) and lack of participation of students in the laboratory activities (36.1%). One of the most important factors is the lack of time. Regarding this issue, both groups of respondents agreed that it was the most serious impediment to the implementation of laboratory work another major factor influencing laboratory work practice is the lack of participation in laboratory activities. Concerning this issue, both groups of respondents agreed that it was the most significant impediment to the effective implementation of laboratory work. ***Question here is why students are not participating in laboratory***

activities. It was found that students were not given activities to participate in laboratory work, ***there was a lack of follow-up, and feedback was not provided.***
Practical work in science has several purposes, including practicing skills, developing specific knowledge and understanding of science, and developing an understanding of the processes of scientific inquiry. It has the potential to contribute to meaningful learning in science (Agogo and Otor, 2013).

This finding in the research includes the lack of equipment funding, lack of understanding of the aims of the changes in the science curriculum, the shortage of time and lack of resources for practical work, the lack of mentorships for inexperienced teachers in order to build confidence in practical work and the inadequate opportunities for training and professional development. In addition, the present study agreed well with Agwai (2008) report, observed that classroom practices in most secondary school chemistry lessons are characterized by chalk-and-talk and little practical work.

The other factors are that, the room of available common laboratories is too small to hold all students and not suitable to work in, in some schools even the rooms are not built for laboratory purpose, doors, windows, roofs are broken. Totally, the laboratory rooms and laboratory environments are dirty and not suitable to work in. This shared truth with the report of Tesfamariam Gebreyes *et al*. (2014) which most laboratory rooms available in secondary schools of Mekele town were not built for laboratory purpose and lacked even the most basic facilities like running water, source of electricity, working tables, sinks, hoods, the rooms windows, roofs and doors are broken. These force all under study school teachers to use only theories to teach their students. This is similar with idea that “most high schools in Ethiopia used to teach practical subjects theoretically without adequate support with experiments due to high scarcity of laboratory equipment and chemicals” (Negassa Olana , 2014).

Laboratory work, like any other educational issue in the teaching-learning process, may have flaws or limitations during its implementation. Among these constraints, the researcher has identified three of the most serious potential factors influencing the implementation of laboratory work in schools. The factors are a lack of

resources, a lack of time to practice laboratory work, and a lack of student participation in laboratory activities.The first major factor affecting laboratory work implementation is a lack of resources. According to students, director and teachers, it is the most significant impediment to laboratory work practice. Enough teaching resources should be available to carry out laboratory work as needed. Teachers can devote more time to assisting students in their quest to learn if appropriate resources and support from schools and higher officials are available. In this regard, 100% of the teachers polled said they were limited in their ability to use laboratory work due to the lack of adequate resources.

5. CONCLUSIONS AND RECOMMENDATIONS

5.1. Conclusions

The study provides valuable insights into the perceptions of teachers and students regarding the practical implementation and activities in chemistry classrooms. Teachers and students believe that practical implementation is essential for engagement, understanding, critical thinking and preparation for future careers as well as many individuals perceive laboratory work as an exciting and engaging way to learn chemistry, there may also be concerns related to safety, technique, real-world application, accessibility, and time constraints. The study's findings revealed that, despite its importance, laboratory work is rarely performed. Furthermore, this result indicated that there was insufficient laboratory equipment (chemicals and instruments) in the laboratory classes, and the classrooms were not comfortable for implementing laboratory activities. Additionally, a lack of resources (such as laboratory equipment), a lack of time to practice laboratory work, and a lack of engagement in laboratory activities were the major factors affecting laboratory work implementation.

The findings suggest that there is a need for on going research and development to improve the effectiveness of chemistry education. By understanding the factors that influence student engagement and learning outcomes, educators can implement strategies to enhance the learning experience in chemistry classrooms.

In generally, since; Ethiopia's higher institution training focuses on science policy to transform agricultural led industry-to-industry-led agriculture, the country needs well-trained workers in the fields of science and the central missions of all schools are to produce good citizens, academically talented and future scientists. Therefore, in order to have students with high science achievement, schools should give special attention to the implementation of effective practical and laboratory activities in science teaching and attract students to science classes in secondary schools.

5.2. Recommendations

Based on the findings of this study, the following recommendations are made:

- Teachers should receive training and support to effectively integrate practical implementation and activity into their teaching methods.
- Schools and educational institutions should invest in providing teachers with the necessary resources, such as laboratory equipment, chemicals, and safety supplies, to conduct practical experiments and demonstrations in their classrooms.
- Real life experiment demonstration, video simulation, animation, use model for teaching to make the subject practical.
- Schools and educational institutions should actively engage students in the planning and design of practical experiments and demonstrations.
- Ministry of Education and Oromia Education Bureau should construct standard laboratory classes separately to each science subjects; fulfill well-trained laboratory technicians, chemicals, apparatuses, well-designed laboratory manuals and fix cooling system to chemical store and the laboratory at whole.
- Seminars, workshops, and conferences should be organized occasionally for teachers and school managements on practical work to create common understanding and awareness.
- Local or international NGOs should focus in improving science education in general secondary schools.

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7. APPENDICES

Wolkite university

College of natural and computational science

Department of chemistry

7.1 Appendix A

Questionnaire prepared for chemistry teachers

Dear Teachers

This questionnaire is designed to collect data on ***"Teacher and Student perception to ward practical implementation and activity in selected secondary school chemistry teaching learning"***. So, your active participation in giving real information is very important for the success of this study and are used for research purpose only. Hence you are kindly requested to give your genuine answer. Please, use "x" to show your level of agreement under one of the five scales of measurement for each question. ***Writing your name in any part of this questionnaire is not necessary.***

Thank you very much!

Key : 1.Strongly agree (SA) = 5 undecided (Und) =3 Strongly disagree (SD) = 1

Agree (Ag) =4 Dis agree (DA) =2

2.Always(Al)=5 Often(Of)=4 Sometimes(Som)=3 Rarely(Ra)=2 Never(Nev)=1

Background information

Sex:Male----------Female----------Age:20-30-------31-40---------Above 40-------

Qualification;Diploma----------Degree(BSC)----------Masters(MSC)---------Experience: 2-5 years-------6-10 years--------11-15 years --------More than 15 years--------

Table 1: Teachers' response on their perception of laboratory work

No;	Item	SA=5	Ag=4	Und=3	DA=2	SD=1
1	Most of the activities are not relevant					
2	I believe that teachers must encourage students to participate actively in laboratory activities					
3	I know that laboratory work adds a workload on teachers					
4	In using laboratory work, teachers find it difficult to cover the prescribed syllabus					
5	Laboratory activities waste a lot of students' time, and most of the activities are teacher-centered					
6	The results of the experiments are predetermined and do not motivate students					
7	Laboratory works are good in theory, but in reality, it is difficult to carry out effective laboratory work					

Table 2: Teacher's response on the practice of laboratory work

No;	Item	Al=5	Of=4	Som=3	Ra=2	Nev=1
1	Laboratory work is practiced in chemistry classes					
2	Teachers participate actively in the laboratory work					
3	The implementation of laboratory work requires well-trained teachers					
4	Encourage students to comment on the results and discuss how it can be improved					
5	I had experience of laboratory work					

Table 3: Teachers' response to possible factors that affect the implementation of laboratory work

No;	Item	SA=5	Ag=4	Und=3	DA=2	SD=1
1	Practical activities specified in science curriculum are the important part of the curriculum that should be implemented					
2	It is impossible to perform practical activities in the absence of well-equipped laboratory					
3	There are trainings organized by administration bodies (Woreda, zone, regional, MoE) that enable science teachers to implement the laboratory work					
4	We have well equipped science laboratory in our school					
5	Our class room condition(transparency, arrangement, class size) is conducive for demonstration of some practical activities					
6	There are supports from education offices (Woreda, zonal, regional, MOE) to facilitate for the implementation of science practical activities					
7	Lack of resources					

7.2 Appendix B

Questionnaire prepared for Students

Dear students

This questionnaire is designed to collect data on ***"Teacher and Student perception to ward practical implementation and activity in selected secondary school chemistry teaching learning"***. Therefore, your active participation in giving real information is very important for the success of this study and are used for research purpose only. Hence you are kindly requested to give your genuine answer. Please, use "x" to show your level of agreement under one of the five scales of measurement for each question.

Writing your name in any part of this questionnaire is not necessary.

Thank you very much!

Key :Strongly agree (SA) = 5 undecided (Und) =3 Strongly disagree (SD) = 1

Agree (Ag) =4 Dis agree (DA) =2

2.Always(Al)=5 Often(Of)=4 Sometimes(Som)=3 Rarely(Ra)=2 Never(Nev)=1

Background information

Sex:Male---------Female----------Age:12-16-------17-20---------Above 20-------Grade-------

Table 4: Student response on their perception of laboratory work

No:	Item	SA=5	Ag=4	Und=3	DA=2	SD=1
1	I believe those teaching theories alone are enough to develop students' knowledge of chemistry					
2	Teaching must prepare students for laboratory activities.					
3	Except for repeating procedures given in manuals, no new knowledge can be learned in laboratory work					
4	I feel fear thinking that many of the chemicals used in the experiments may cause health hazards to me					
5	Laboratory work is not economical to use in teaching-learning.					

Table 5: Students response on the practice of laboratory work

No;	Item	Al=5	Of=4	Som=3	Ra=2	Nev=1
1	How often do you practice laboratory activities					
2	I participate actively in the laboratory session					
3	Laboratory work makes us responsible for our own learning					
4	Laboratory work requires a lot of time					
5	In the report, we write exactly what the teacher tells us					

Table 6: Students' response on factors affecting the implementation of laboratory work

No;	Item	Strongly Agree=5	Agree=4	Undcide de=3	Disagree =2	Strongly diagree= 1
1	Shortage of time to practice laboratory work					
2	Students' lack of interest in laboratory work					
3	Student knowledge of laboratory activities					
4	Teachers' knowledge of laboratory work					
5	Some students' dominance during laboratory work					
6	Lack of involvement of students in the laboratory activities					
7	Lack of resources					

7.3 Appendix C

Classroom observation format

Table 7: Condition of the laboratory room.

No;	Item	Yes	No
1	There are enough sitting spaces for all students		
2	The seats are comfortable to do laboratory activities		
3	The classroom layout is arranged to facilitate laboratory work		
4	There is sufficient laboratory equipment (chemicals and instruments) in the laboratory class		
5	There are sufficient windows of hoods (air inlet and outlet space) in the laboratory class		

Table 8: Teachers' activities

No;	Item	Yes	No
1	Arranging students for different laboratory activities		
2	Giving direction about the procedures of the laboratory activities		
3	Giving directions about how to write reports		
4	The teacher is active in explaining, monitoring and describing activities		
5	The teacher gives activities to the students		
6	The teacher asks questions to the students		
7	The teacher follows up students' activities and their participation in the laboratory work		
8	The teacher evaluates students cooperation in the laboratory work		
9	The teacher checks and gives constructive feedback on the students' laboratory activities		

Table 9: Student activities

No;	Item	Yes	No
1	Students are active in participating in the laboratory activities		
2	Each student is playing role in the group discussion		

7.4 Appendix D

Interview prepared for teacher and school of director

The purpose of this interview is to obtain information about the **Student and Teacher perception to ward activity of laboratory work and implementation in chemistry classes of secondary schools, and the challenge facing its implementation in teaching and learning chemistry in secondary schools.** Therefore, I kindly request you listen to each item thoroughly and provide the correct response.

Thank you very much!

I. Interview question for Teachers

1. What problems do you experience regarding the implementation of laboratory work
2. Is the chemistry subject teachers received training in the laboratory?
3. Whether at school there is facilities for chemical laboratories?
4. Laboratory work makes students love the subject matter?

II. Interview question for Directors of the school

1. What factors affecting the implementation of laboratory work?
2. Laboratory activity are practiced in your school?
3. What was the condition of chemical laboratory facilities?
4. Are there any funds or special budget for care and the provision of tools and chemicals
5. Do you frequent monitoring of the activities in the school chemistry lab father?