

# How to improve students' participation in chemistry class: The case of 2nd Year Chemistry students taking the course Practical Organic Chemistry

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**Abstract**-The purpose of this study is to improve students' participation in chemistry laboratory work by identifying and decreasing the existing factors that affect students' participation during laboratory work, in the case second year chemistry students at Adigrat University. It is well known that doing laboratory work leads to improved process skills, and the acquired skills may promote a more desirable attitude towards the subject. However, laboratory works have generally been haltered in recent educational environments for a variety of reasons. In order to address this gap, this study was conducted to assess the factors that affect students' participation in chemistry laboratory works on student participation and achievement among 96 students from three different sections. Study data were gathered with pre and post laboratory Test, laboratory equipment test, unstructured observations, questionnaires, and interview and group discussion. The Acquired data were analyzed by using Statistical Package for Social Sciences 16.0 (SPSS 16.0) program and primarily descriptive statistics such as frequency distribution and percentages. It was concluded that Based on the findings presented above the following conclusions were made: All of the respondents are academically poor and the department in which they are currently enrolled is totally not their choice; Lack of interest to the department and preparation before actual class are the major factors causing the students to be passive in the class room; Unpleasant class room environments was also found to be the major abstracts to students class participation; Teachers heavy reliance on teacher centered teaching method (lecture) and absence of special support for low achiever students has greatly influenced students class participation.

**Keywords** –Practical organic chemistry, questionnaire, interview, unstructured observation

## INTRODUCTION

### *Background of the study*

Chemistry is an 'enabling science' as its core concepts are essential for almost every area of science [1]. It is studied both as a discipline in its own right and as a central component of other degree programs. Chemistry is also a highly conceptual discipline, requiring an ability to deal with phenomena at both a macroscopic and microscopic level, and to connect with symbolic representations used at each of these levels. Students may experience difficulties with their learning if this symbolic language is taken for granted, and there is a risk that connections between the material world and theoretical constructs may be misunderstood [2,3]. The laboratory environment is a bridge between theory and praxis, it offers unique opportunities to assist students as they attempt to construct an understanding of these connections.

Several studies revealed that laboratory instruction is a cornerstone of most science programs because it allows students to be actively involved in their learning. Many educators value the laboratory's instructional potential, but laboratory has also been the focus of considerable criticism concerning the lack of student learning in laboratory. It suggested that suggests that the most popular, though most criticized form of laboratory instruction, the expository or "cookbook" style, has evolved into its present form from the need to minimize resources such as time, space, equipment, and personnel. Certainly these factors are important in laboratory practice in chemistry subjects where hundreds or thousands of students must use the laboratory facilities every week. I must focus on laboratory practice in chemistry teaching under these constraints [4].

Researchers studied both the factors that contribute to teaching effectiveness and the evaluation of teaching effectiveness. Although this research has not provided brief and clear definition of teaching laboratory or the laboratory practice, many researchers have developed their own working definitions of teaching effectiveness. Majority of research concerning teaching effectiveness, however, has focused on traditional classroom instruction. There is very little research that focuses on teaching effectiveness in the laboratory. Despite the lack of research concerning effective laboratory instruction, the laboratory instructor is considered an important factor in student learning in laboratory [5, 6, 7]

For effective teaching learning process to take place active participations is one of the most critical requirements. Many researchers agree that the implementation of active teaching methods heavily relies on the active participation of students in class room.

In the educational policy of our country more emphasis is placed on the importance of active teaching methods. The government has been implementing various strategies, policies and capacity building efforts to promote active teaching and learning process. This is to create a paradigm shift from teacher centered approach of leaning which has been done for many years in the country to student centered approach.

The recently adopted modularization approach is a typical example of the country's commitment to implement student centered approach. Higher diploma program (HDP) is also one of the capacity building efforts of promoting active methods of teaching and learning process. However the designing and implementation of such policies and programs could not be effective if the students in every class taking various courses are not actively participating in the teaching and learning process.

Many studies have indicated that the academic performance and class participation of students is diminishing from time through the country. This problem is much prevalent in low achiever students than their active counter parts. This also confirmed by the experience and observation of the researchers in their respective classes at Adigrat University. Due to this an action research was conducted on to improve the low level participation in class room in the case of Second Year Chemistry students who take the course Practical Organic Chemistry I.

## II. OBJECTIVES OF THE STUDY

### *General objective*

The overall objective of the study was to improve class participation of low achiever students in Adigrat University in the case of Second Year Chemistry students who take the course Practical Organic Chemistry I.

### *Specific Objectives*

This research was intended to:

- ✓ To assess the status of chemistry laboratory implementation in Chemistry laboratory
- ✓ To identify factors affecting the implementation of chemistry laboratory activities
- ✓ Identify factors that cause low level class participation of students
- ✓ Implement strategies that improve low achiever students class participation
- ✓ Recommend possible ways of improving low achiever students class participation to concerned bodies of the institutions

## III. SIGNIFICANCE OF THE STUDY

Conducting this action research is significant in many ways. Firstly it will contribute in filling the knowledge gap regarding low achiever student's participation in chemistry laboratory work. Because similar research was absent in our university. Secondly it will assist the successful implementation of the modularized course delivery system of the University which is much student centered approach to learning. It will also help to a wake educational officials at different levels and teachers on problems of chemistry practical work so that they can set their own relevant strategies to solve the problems. Moreover, it may use as a stepping stone for those who are interested to conduct further investigation on the area.

## IV. REVIEW OF RELATED LITERATURES

### *Importance of students Class Participation*

Students are more motivated, learn better; become better critical thinkers, and have self reported gains in character when they are prepared for class and participate in discussions. The more they participate, the less memorization they do, and the more they engage in higher levels of thinking, including interpretation, analysis, and synthesis. Students who participate also show improvement in their communication skills, group interactions, and functioning in a democratic society [8].

### *Factors for low level of students class participation*

One reason is class size, with students being more willing to participate, less anxious about participating, and less likely to be able to in smaller classes than larger classes; large class size tends to hamper communication.

Another reason that students may not participate in class is because of their own personal fears of feeling inadequate in front of others, regardless of the logistics of the classroom setting. A research revealed that students may feel intimidated or inadequate in front of their classmates and teachers, and thus choose not to participate. Students even reported confidence as the most motivating factor for their participation in several studies. [10, 11, 12]

## V. RESEARCH METHODOLOGY

### *Sampling and research participants*

The research participants are Second Year Chemistry students those who take the course Practical Organic Chemistry I. They are a total of 96 students among them 34 are females and 62 are male students.

### *Methods of Data collection and source of data*

As the purpose of the study was to improve participation of students in chemistry class at Adigrat University and to take action, primary data was collected by the researchers using the following data collection instruments: questionnaires, interview and observation.

### *Method of data analysis and presentation*

In the present study, the study data collected through interviews, questionnaires and observation was analyzed using descriptive statistics such as frequency distribution and percentages. In this analysis descriptive statistics frequency was calculated and tabulated. Then the finding was displayed or presented in tables, graphs, diagrams and in text.

### *Actions implemented*

To improve class participation of low achiever students, the following strategies were implemented:

- ✓ Teaching some of the basics of practical organic chemistry in tutorial classes
- ✓ Counseling the importance of class participation
- ✓ Providing tutorial class to those students before regular classes
- ✓ Use of active learning methods
- ✓ Letting students prepare before classes

## VI. RESULT AND DISCUSSIONS

### *Background of Respondents*

*Age structure of respondents*

As indicated in Table 1, majority of respondents (93.75%) fall between the age group of 18-25 years old. The remaining 6.25% were found to be less than 18 years old.

Table 1: distribution of respondents by age

Age group	Frequency	Percent
<18	6	6.25
18-25	90	93.75
<b>Total</b>	96	100.0

Source: own survey 2017

*Academic performance of respondents*

Table 2 showed that most of the respondents have scored below 25 out of 50% in Practical Organic Chemistry I continuous assessment. In addition to this, from my observation in the class room, these all students' class participation was poor. This implies that all of the respondents have poor academic performance.

Table2: Marks obtained by 96 second year chemistry students in pre laboratory examination

Marks obtained out of 50%	N <sub>2</sub> of students(frequency)
0-10	31
10-20	38
20-30	15
30-40	8
40-50	4

Source: own survey 2017

*The way participants joined the department*

As indicated table 3 when respondents join the department, more than half of the respondents (54%) stated that the current department was not their first choice. Not only had that ten of the respondents stated that Chemistry department was their sixth choice (the last choice) while the remaining five students chemistry department was her fifth choice. This shows that most students are not interested in their current department.

Table3: Students response on their choice when they joined the department of chemistry

Item	Choice	Frequency	Percent
When I joined university, chemistry was my	first choice	46	47.92
	second choice	20	20.83
	third choice	15	15.63
	fourth choice	5	5.21
	last choice	10	10.41
	Total	96	100.0

Source: own survey 2017

*Family Economic Status of respondents*

The results in Table 4 indicated that the all except twelve (12) of the respondents are from poor family and countryside areas of Ethiopia. Twelve respondents are from medium level family and good school. The underlying issue here is if students are from poor family their attention will be disturbed by family related problems. And also if they are from countryside regions of Ethiopia, probably they are not from good schools.

Table 4: Distribution of respondents by their family economic status

Income group	Frequency	Percent
Poor	84	87.5
Medium	12	12.5
Rich	-	
<b>Total</b>	9	100.0

Source: own survey 2017

*Student behavior related variables affecting respondent's class participation*

Students have different personal behaviors which are unique and having paramount effect on their class participation. Some of these behaviors make them to participate more while some others negatively affect their participation. From this point of view analysis of some important student's personal behavior was made and the results are presented in table 5. The table indicates that Lack of interest and preparation to class caused the students not to participate actively. While the response of respondents indicated that they are all interested in the course. The effect of personal problem related issues was found to be totally insignificant.

Table 5: Student behavior related variables affecting respondent's class participation

Item	Response	Frequency	Percent	Total
Lack of interest on the course	Yes	70	72.92	100
	No	26	27.08	

<b>Lack of preparation for class</b>	Yes	85	88.54	100
	No	11	11.46	
<b>Personal problem</b>	Yes	2	2.08	100
	No	94	97.92	

Source: own survey 2017

#### *Course nature and class room environment relates factors*

As shown in Table 6 the participants of the research stated that the course is difficult to them (77.08%) restricting them from participating in class. The other is that the unpleasant class room situation has negatively affected their class participation, which was confirmed by 25% of the research participants.

Table 6: Course nature and class room environment relates factors affecting class participation

Variables		Frequency	Percent	Total
<b>Course difficulty</b>	Yes	87	77.08	100
	No	12	22.92	
<b>Unpleasant class room</b>	Yes	24	25	100
	No	72	75	

Source: own survey 2017

#### *Teacher related factors affecting the student's class participation*

As indicated in the table 67 below 70.83% of respondents stated that the instructor uses teacher centered (inactive) method of teaching which negatively affects their class participation. The participant also stated that (68.75%) of the instructor doesn't give special encouragement for these low achiever students to participate. Finally 89.58% respondents stated that their teachers don't allocate time for advising. The other factors were found to be in line with active class participation. As indicated in the table the other factors have insignificant contribution to the low level student's participation in class room.

Table 7: Teacher related factors affecting the student's class participation

Variables		Frequency	Percent	Total
<b>The instructor starts class on time</b>	Yes	92	95.83	100
	No	4	4.17	
<b>The instructor encourages low achiever students participate</b>	Yes	30	31.25	100
	No	66	68.75	
<b>The instructor uses active teaching methods</b>	Yes	28	29.17	100
	No	68	70.83	
<b>The instructor advises students by allocating consultation hour</b>	Yes	10	10.42	100
	No	86	89.58	
<b>The instructor provides timely feedback on assessments</b>	Yes	72	75	100
	No	24	25	
<b>The instructor discourages students replying wrong answer</b>	Yes	0	0	100
	No	96	100	
<b>The instructor rewards actively participating students</b>	Yes	80	83.33	100
	No	16	16.67	
<b>The instructor motivates the students to participate</b>	Yes	72	75	100
	No	24	25	

Source: own survey 2017

## VII. CONCLUSIONS AND RECOMMENDATION

### *Conclusion*

Based on the findings presented above the following conclusions were made:

- Most of the respondents are academically poor and the department in which they are currently enrolled is not their first choice.
- Lack of interest to the department and preparation before actual class are the major factors causing the students to be passive in the class room.
- Unpleasant class room environments was also found to be the major abstracts to students class participation
- Teachers heavy reliance on teacher centered teaching method (lecture) and absence of special support for low achiever students has greatly influenced students class participation

### *Recommendation*

Based on the findings of our action research the following recommendations are made to improve student's class participation.

- Tutorial class before and after class
- Guidance and counseling
- Implementation of active learning methods
- Letting students prepare before classes

The above recommendations were the actions taken by the action learning set to improve the class participation of our respondents. In addition to these the following long term measures should be taken in order to bring better students class participation.

- Keeping low achiever students department choice

- Improving class room environment

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