

## **STUDENTS' ANXIETY TOWARDS THE LEARNING OF CHEMISTRY IN SOME ETHIOPIAN UNIVERSITIES**

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### **ABSTRACT**

Chemistry is a human endeavor that relies on basic human qualities like creativity, insights, reasoning, and skills. It depends on habits of the mind: skepticism, tolerance of ambiguity, openness to new ideas, intellectual honesty, and curiosity. The study was thus designed to find out students' anxiety towards the learning of chemistry, identify the factors that cause the anxiety, examine the disposition of sex towards the learning of chemistry and suggest ways to increase their taste towards the learning of the subject. Data for the study were obtained by administering a questionnaire to 300 respondents. The data obtained were analyzed using frequency counts, percentages and stanine test. The finding of the study revealed that the students, whether male or female, urban or rural based, show great anxiety towards the learning of chemistry and that the anxiety is higher in female and rural based students than male and urban based students. The cause of students' anxiety as revealed by the study includes; redundancy of the curriculum, low awareness of career opportunities, the teachers and their teaching methods and lack of teaching aids/laboratories. [AJCE, 3(2), June 2013]

## **INTRODUCTION**

The role of science education in the lives of individuals and in the advancement of science and technology for the development of mankind and the society in general is very crucial. Scientific literacy, which is the gateway to achieve scientific and technological advancement and economic survival, is achievable through science education. The influence of science on a nation and its citizens could be seen from the production of basic human needs to social, political, educational, technological and economic advancement. The steps scientists take during scientific investigation (science processes) and scientific products draw the attention of the society to the fact that science makes life comfortable.

Chemistry is a very important science subject in senior secondary school curricula worldwide. It is a core subject for the medical science, textile technology, agricultural science, synthetic industry, printing technology, pharmacy, and chemical engineering. As important as the subject is and in spite of the efforts of both the federal and state governments to encourage chemistry education, students still shun the subject (1-2). It has been observed that most students fear chemistry and hence they see chemistry as difficult to understand, which may be as a result of the abstract nature of chemistry and the method (lecture method) being used by most of the chemistry teachers. Students' anxiety for chemistry learning can also be attributed to students' perception about the difficult nature of chemistry, involvement of multitude of facts, and its disconnection from reality (3). Students' anxiety for chemistry learning leads to loss of interest in the sciences (4). In spite of the long existing fear and its effects on the subject, in Ethiopia researchers had done little or nothing on the basic psychological factors that could generate such anxiety.

## **PURPOSE, RESEARCH QUESTIONS AND METHODOLOGY OF THE STUDY**

This paper aimed at finding out the causes of students' anxiety towards the learning of chemistry. To achieve this stated goal, the paper will especially examine the basic factors that could cause students' anxiety towards the learning of the subject. It will also assess the impact of sex and location of the students on their disposition and perception of the subject.

The paper is set to provide answers to the following research questions:

1. What are the causes of students' anxiety towards the learning of chemistry in Addis-Abeba, Dire Dawa AND Adama Universities?
2. What is the impact of sex and background location of the students on their disposition and perception of the subject in universities?
3. What can be done to increase the students' taste towards the learning of the subject?

The study employed the survey type of descriptive research. The population consisted of 2009/2010 second year chemistry students in three public universities (Dire Dawa, Adama and Addis Ababa). The multi stage sampling technique was used to select the subjects for the study. The students in the department were then separated in to their background location (rural and urban) and then according to sex type (boys & girls). In each university having ratio of one rural and one urban background were randomly selected. Thus a total of 360 subjects formed the sample. The only instrument used to generate data for the study was a structured questionnaire.

A pilot survey was first carried out and from its outcome, the main questionnaire was structured. The instrument was validated by three senior colleagues (one from science education, one from guidance and counseling and the third from test and measurement). Of the 360 copies of the questionnaire administered, 300 copies that were answered in full were analyzed using percentages and stanine test.

## RESULTS AND DISCUSSIONS

This section provided answers to the research questions raised earlier in the study. The results are presented below.

### A. Causes of Students' Anxiety towards the Learning of Chemistry

From the survey, 40 factors that score students from learning chemistry were identified. These factors were then subjected to stanine test (where stanine 1-3 is low agreement 4-6 is medium agreement and 7-9 is high agreement). The students were also asked to rank 16 out of the 40 anxieties in order of severity. The highest ranked 16 among the anxieties using the stanine test are shown in Table 1.

Table 1. Students' anxieties towards the learning of chemistry

<i>Causes of students anxieties</i>	<b>Number</b>	<b>%</b>	<b>Stanine</b>
Chemistry syllabus is too wide	291	97	9
Chemistry demand too much of calculation	287	96	9
It is difficult to understand chemical equations and arithmetic	285	97	9
There are more failures in chemistry examination than passes	282	94	9
I don't know where to work if I finish my course in chemistry	279	93	9
The major employment for chemistry is classroom teaching	270	90	9
I am scared by chemistry practical	262	87	8
I prefer Economics or Accounting to chemistry	252	84	8
Chemistry is too abstract due to the way the teacher teaches it	245	82	8
My chemistry teacher lack innovation, encouragement and resourcefulness	240	80	8
My chemistry teacher does not make use of teaching aids while teaching	238	79	8
Chemistry is too abstract because we've never seen most of the things being taught	231	77	8
The chemistry laboratory is ill equipped	225	75	7
Students are not exposed to practical until the final certificate examination approaches	216	72	7
No excursion, no fieldtrip so, no exposure	213	71	7
Chemistry teachers are too thorough in their assessment	210	70	7

From Table 1 above, the causes of student' anxieties can be classified into four categories namely; the course content (syllabus), employment prospects, teacher's interest and methodology and teaching aids and laboratory. All these boil down to curriculum planning and implementation. This finding corroborates the observation of the South African Ministry

Education (5) that the use of unqualified and under-qualified teachers has the tendency to influence teaching negatively with its implications on performance.

Ninety-seven percent (97%) of the students held the popular notion that the subject is too wide, demanding and rather cumbersome; about 96% of them feared chemistry because it demands too much of calculation while 95% were of the opinion that it is difficult to understand chemical equation and arithmetic. About 94% revealed that there are more failures in Chemistry examination than passes. Furthermore, about 87% of the students said they are scared by chemistry practical works.

The next fear of the students is based on employments prospect. Up to 93% indicated that they don't know where to work and 90% believed that classroom teaching is the major employment opened to graduates of chemistry.

The third source of anxiety is centered on the teacher. Up to 82% say chemistry to be too abstract due to the method the teacher uses while teaching and about 80% accused the teacher of lack of interest, innovation, encouragement and resourcefulness. This is corroborated with the assertion of 79% of the students that their teachers don't make use of teaching aids while teaching Chemistry. Another thing that kills the interest of the students as claimed by 70% of the students is the extra-ordinary thoroughness of the teachers in their assessments. These support the findings (6) that established a positive relationship between teacher's quality and interest of students in science subjects.

The fourth source is lack of well-equipped chemistry laboratories, excursions and fieldtrips. No wonder 77% of the students complained that chemistry is too abstract because they have never seen most of the things being taught. This negates the major aim for chemistry teaching that the study of chemistry, among other things, will enable the student to know the link

between chemistry and industry, the environment and everyday life in terms of benefits and hazards.

Furthermore, 75% of the students attested to the poor condition of chemistry laboratories in their respective schools. This is responsible for the opinion of about 72% of them that students are not exposed to practical works until the final examination approaches. All these point to the fact that the students lack exposure as supported by the assertion of about 71% of them that there is no excursion, no fieldtrip and no exposure to real life related chemistry applications.

### **B. Impact of Gender on Students Disposition to the Learning of Chemistry**

The study revealed that female students show more fear or anxiety towards the learning of chemistry than their male counterparts. Out of the 16 highest anxieties indicated, the male students showed higher anxiety over the females in just only five while the female's recorded higher anxieties in eleven. The major problems of the males is centered (in descending order) on wide syllabus, ill-equipped laboratory, lack of exposure to practical works, lack of exposure to excursion and fieldtrips and strictness of the teachers.

The females are scared most by the broadness of the syllabus, too much of calculations, more failure than passes, job opportunity and quality and methodology of chemistry teachers. These fears partly justify the fewer number of students currently studying the subject in the universities studied. This finding clearly supports the established fact that gender differences exist in specific abilities of students (7-10) and that these differences are based on some in born characteristics (11).

### **C. Impact of School Location on Students' Disposition to the Learning of Chemistry**

A critical analysis of rural and urban students' perspective towards the learning of chemistry shows that students in rural areas registered more fear in learning chemistry than their

counterparts in urban area. Among the highest 16 anxieties ranked, the rural students indicated greater anxiety in eleven while the urban students indicated in just five.

Students in the rural areas are scared by (in descending order) job opportunities, wide coverage of the syllabus, lack of exposure, teacher's qualities and methodology and more failures than passes. On the other hand, urban students registered their anxieties (in descending order) in too many calculations, more failures and too wide syllabus.

This observation could be attributed to various factors some of which include:

- The quality and quantity of chemistry teachers in urban areas
- More exposure to things being taught and job opportunities in urban areas
- More opportunities of attending evening lessons extra-mural classes, etc than those in rural areas which give them the opportunity of covering and revising the syllabus before finally sitting for any examination, be it internal or external.

These findings are in line with Chambers and Andre (12) that differences between the genders in learning any physical science topic can probably be attributed to differences in prior experiences, interest and knowledge. There is no doubt that students in urban locations are more exposed than their counterparts in rural locations.

#### **D. Suggestions to Reduce Students' Anxieties**

Lists of 20 suggestions or conditions were presented before the students to choose which of them when met will increase their interest to chemistry to any level. The highest 10 suggestions of the students are presented in Table 2.

Table 2. suggestion to students' anxieties

<i>Suggestions to Reduce Students' Anxieties</i>	<i>Number</i>	<i>%</i>	<i>Stanine</i>
Reduction of chemistry syllabus	285	95	9
Exposure of all career prospects to students	273	91	9
Provision of more qualified teachers	261	87	8
Organized many excursions and fieldtrips for more exposure	258	86	8
Encourage the use of instructional material and teaching aids	255	85	8
Provisions of standard and well-equipped chemistry laboratory	244	81	8
Exposure of students to practical chemistry right for university student	236	79	7
If my chemistry teacher can show interest in the subject, motivate and encourage me	230	77	7
If my chemistry teacher can improve on his teaching methods	226	75	7
Reduce exercises involving too much calculations	220	73	7

From Table 2, no wonder that students' first request is the reduction of the syllabus given the fact that the major obstacle to most students who would have loved Chemistry is the overloaded syllabus. The curriculum developers are therefore called upon to further review and reduce the syllabus to a manageable size (without reducing the quality at the level) for both the teachers and the students.

About 91% of the students would be ready to study Chemistry to any level if they are exposed to all the career prospects in chemistry. There is thus the need for proper counseling to wipe off the erroneous notion the students already have that it is only in the classroom that a chemist could get a job. It is also necessary to make them understand the central role chemistry plays amongst the sciences and the various disciplines/courses in the tertiary institutions where chemistry is required as a prerequisite. It could also be beneficial if something like business chemistry and entrepreneurship in chemistry is introduced to students through appropriate means without overloading the already crowded curriculum.

In the third place we could see the students calling for more qualified teachers to teach the subject. It is pertinent to know that in some of the university studied just any teacher who graduated in any of the science courses is engaged in teaching chemistry. Besides, out of the

limited qualified graduate teachers, about 70% are in urban areas leaving just 30% to the rural areas. This clearly shows that the rural areas are at disadvantage in almost everything that could make the learning of chemistry real, interesting and meaningful.

Apart from quality, the quantity of chemistry teachers available in the schools is grossly inadequate and the few that are available are concentrated in the urban areas thus making those in the rural areas to be overloaded. This overloading effect will of course reduce their effectiveness, innovative ability, resourcefulness and encouraging power which the students also complained of. The government is therefore urged to intensify the training and employment of more qualified graduate teachers who should be evenly distributed among schools in rural and urban areas.

Another suggestion made by the students is the provision of standard and well-equipped chemistry laboratories, exposure of students to practical chemistry right from secondary school and organization of excursion and fieldtrips for more exposure. The findings of this study have revealed that not up to 20% of 80% of the universities have ever attempted fieldtrip or excursion either within or outside their environment for the past five years. Serious attention should be given to all these as they will further enhance the interest of the students in the subject.

The students also complained of poor teaching methods of their teachers and then suggested that they will love to study chemistry if the teachers can improve on their teaching methods. There is no gainsaying it that bad method of teaching will of course predetermine poor performance and kill students' interest. The writers therefore enjoin all teachers teaching chemistry to be resourceful, motivating, enthusiastic and encouraging if actually we want to achieve the technological advancement we are yearning for in this nation.

## **SUMMARY AND RECOMMENDATIONS**

The findings of this study revealed some of the basic causes of students' anxiety towards the learning of chemistry such as wide coverage of the syllabus, low awareness of career opportunities in the subject, lack of exposure to excursion and fieldtrips, well equipped laboratory, as well as poor teaching methods. Although, all the students, whether male or female, urban-or rural based, show great anxiety towards the learning of the subject, the anxiety is higher in females and rural-based students than their male and urban-based counterparts.

Since the major obstacle to most students who would have loved chemistry is the redundancy of the syllabus, the curriculum developers are called upon to further apply the modular approach and reduce the redundancy to manageable size (without reducing the quality at that level) for both teachers and students. Teachers also need to be aware of the effects of anxiety on students' achievement and motivation during their training so that they make an effort to lessen anxiety through:

- Developing teaching strategies that help highly anxious students
- Creating an environment in which students do not feel threatened and allow them to relax
- Using cooperative grouping to help students understand that others have the same problems as they do
- Teaching at a slow pace to help students better comprehend the material being taught
- Providing extra tuition sessions so that students are not left behind academically
- Paying serious attention to field trips and laboratory activities

With all these efforts it can be a positive force in reducing Chemistry anxiety. Chemistry teachers should show their students a sincere, caring attitude to help them overcome Chemistry anxiety.

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