

## Assessment on Students' Self-efficacy, Academic Achievement, Locality and Gender in Chemistry at Woreillu Secondary School, Ethiopia

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### Abstract

Students' achievements in scientific subjects, such as chemistry, have stringently declined during the past decade. In order to disrupt these declining results in scientific subjects, it's important to identify factors leading to decreased academic achievements within the scientific subjects. This study aims to investigate the association between students' achievements in chemistry and self-efficacy beliefs, gender, and locality among Woreillu high school grade 10th students. This study found that students' level of self-efficacy is medium (57.8) and rural students scored significantly better achievement results than urban students in both sexes. An independent sample t-test analysis showed that there were significant differences in the self-efficacy of chemistry between male and female students. The study found that male students' self-efficacy and achievement results were higher than those of females were. The Pearson correlation test showed that there was significant relationship between self-efficacy and academic achievement. The study revealed that there were gender difference in self-efficacy and academic performance but there were no locality influences on students' self-efficacy. These findings are in conformity with the self-efficacy theory, which states that an individual's attempt tasks, in which he/she believes he/she is good at, are truly very likely to become successful. The implication of the findings from this study can assist the Ministry of Education Ethiopia, schools, and teachers, especially science education teachers, in developing strategies to enhance student science self-efficacy and thus, increase students' participation in Science/chemistry streams.

**Keywords:** Self-efficacy; Academic performance; Gender; Locality; Chemistry

### Introduction

Self-efficacy is defined as one's belief in his/her capacity to perform a specific action successfully [1,2]. Self-efficacy determines how people feel, think, motivate themselves and behave. Such beliefs produce these diverse effects through four major processes, which include cognitive, motivational, affective and selection processes. A strong sense of efficacy enhances human accomplishment and personal well-being in many ways, such as academic achievement.

Students might have different self-efficacy judgments in different types of tasks or domains. For instance, a student who feels efficacious in biology might not feel that efficacious in chemistry. Self-efficacy influences people's choice of tasks, showing effort and persistence at the task, and thus, is a better predictor of performance and motivation compared to other variables [1]. Similarly, authors [3-5] have affirmed the relationship between self-efficacy and students' achievement. According to [6], self-efficacy beliefs mediate the effects of prior achievement, knowledge and skills on subsequent achievement. For instance, in schools, students with high self-efficacy tend to choose more challenging tasks, show more effort, and do not give up easily, which explains why students of similar ability can have different academic achievement [1].

Efficacious students look for new challenges, show persistence at tasks and have the ultimate success [4,7]. Even though such students have prior difficulties, the belief in their capabilities to overcome these difficulties results in the motivated performance [6,8] Studies have shown that science self-efficacy is associated with science achievement and science-related choices across grade levels [4,9] also found out that science self-efficacy predicted achievement at the college level. Among high school students, science self-efficacy was found to be a good predictor of achievement and engagement with science-related activities than gender and parental background [10].

Moreover, World Bank study conducted in 2001 in Sub-Saharan Africa noted that gender differences are close to being estimated at the primary level at least in the region as a whole. However, the disadvantage towards females is still prominent at the secondary school level [11,12].

Acknowledges regional and gender disparities virtually in all countries in the provision of education albeit at a varying levels. Besides, this imbalance also disadvantages women. Previous Ethiopian General Secondary Education Certificate Examination (EGSESCE) and Ethiopian University Entrance Examinations (EUEE) Chemistry results in Woreillu Secondary and Preparatory School highlight this disadvantage. For example, among those who obtained grade 'A' in Chemistry, 19% were girls and while 81% were boys in grade 10<sup>th</sup> and among who scored 50 and above in Chemistry, 16.5% were girls and 83.5% were boys in grade 12<sup>th</sup> results.

A grade 'F' is the lowest score whereas a grade 'A' is the top score. These percentages show that compared to boys, girls are not performing well in Chemistry subject. An assessment of the quality of grade and results in EGSESCE and EUEE respectively in Woreillu, Ethiopia indicates a very small percentage of female students get good grades in Chemistry. Poor academic achievement in Chemistry could probably

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be linked to low self-efficacy among secondary and preparatory school students. Thus, this study sought to examine gender differences on self-efficacy and academic achievement among grade 10<sup>th</sup> students in Chemistry subject.

According to [1,8] self-efficacy may explain course selection patterns in high school which eventually had to under representation of women in science. Self-efficacy strongly determines whether students continue pursuing science based courses. If a female student believes that she is unable to succeed in science like Chemistry, her poor perception manifests itself in lower grades or in avoidance of science courses [13]. Gender difference in science classrooms have been and continue to be a problem [13]. Despite improvements in enrolment in the past two decades, girls are still less likely than boys to take higher level of science course.

the courses or subjects that students choose at high school and their subsequent academic achievement can influence not only their admission to college, but also their choice of a college major [14]. Starting in seven grades, girls tend to underestimate their abilities in science even though their performance remains at par with that of the boys [7]. This trend continues in high school. "A loss of self-confidence rather than any differences in abilities may be what produces the first leak in female pipe line in science" [15].

As a science subject, chemistry is concerned with the study of composition and properties of natural substances. It occupies a pivotal position in science and technology and is needed by everybody and in every aspect of human endeavor [16-18]. For instance, human beings have used organic compounds and their reactions for thousands of years in the manufacture of many valuable products for men use e.g. soap, oils, hydrogenated oil, kerosene, petrol, plastic, lubricants, Vaseline, ceramics and detergents. More so, the ancient Egyptians used organic compounds (indigo and alizarin) to dye cloths, which are products of scientific discovery. Chemistry is regarded as the hub of science and it is considered as a service subject [19]. Chemistry is the catalyst for sustainable national growth and development.

In spite of the central position of chemistry among science subjects and its importance in sustaining sustainable economic growth and development, the performance of Woreillu secondary school female students result over the years is not encouraging.

From my experiences as a Chemistry teacher for five years in secondary and preparatory school, it was noticed that students had varying levels of confidence in their abilities for success in Chemistry. Female students seemed to express the highest doubts in their capabilities whereas male students frequently seemed over confident. These variations in confidence will affect their learning of Chemistry. Hence, self-efficacy in science affects science learning, choice of science, amount of effort exerted, and persistence in science [15]. Therefore, considering the issues from the related literature, the purpose of this study is to investigate the relationship between gender, locality, self-efficacy and chemistry students' academic achievement in Woreillu secondary school, Ethiopia.

In discussing this case, we also seek to answer the following questions:

- What is the self-efficacy level of Woreillu grade 10<sup>th</sup> students in chemistry?
- Is there a difference in self-efficacy between male and female students in chemistry?

- Is there a difference in self-efficacy between urban and rural students in chemistry in both sexes?
- Is there a difference in academic achievement between male and female students?
- Is there a difference in academic achievement between urban and rural students in chemistry in both sexes?
- What kind of relation is there between the score of self-efficacy and the score of chemistry?

## Review Of Related Literature

Self-efficacy is largely grounded in the social cognitive theory. This theory explains that human functioning results from interactions among personal factors (e.g., cognitions, emotions), behaviors and environmental condition [1,8]. From this perspective, self-efficacy affects one's behaviors and the environments with which one interacts and is influenced by one's actions and conditions in the environment. Self-efficacy is hypothesized to affect individuals' task choices, effort, persistence and achievement [1,6]. Compared with learners who doubt their capabilities, those who feel self-efficacious about learning or performing a task competently are apt to participate more readily, work harder, persist longer when they encounter difficulties and achieve at higher levels. Learners acquire self-efficacy information from knowledge of others' performances through social comparisons. Similar others offer the best basis for comparison. Students who observe similar peers learn a task may also believe that they can learn it. Such vicarious information typically has a weaker effect than actual performance because vicariously induced self-efficacy can be negated by subsequent performance failure.

Some researchers such as [20,21] have reported that students' beliefs in their abilities to achieve desired goals strongly influence their academic achievement. In view of this [22] concluded that academic self-efficacy reflects the extent to which students believe that they can successfully perform in school. Self-efficacies are usually positively correlated with outcome expectations but it is possible that a student has high self-efficacy but low expectations about the grades earned from the examinations [23].

Self-efficacy beliefs develop because of information from four types of resources: mastery (enactive) experiences, vicarious experiences, verbal persuasion and physiological states. Mastery or enactive experiences are derived from what one has experienced are said to be the most forceful reference of self-efficacy beliefs. Vicarious experiences are gained by observing a model's performance and comparing it with the observer. A comparatively weak source of self-efficacy is the persuasion like 'I have faith in you' given by others. The last source of students' self-efficacy is physiological reactions, which are stress, anxiety and other feelings seen as signs of physical incompetence [1].

Self-efficacy beliefs are domain specific and refer to perceptions of capabilities to learn or perform given tasks within specified domains [24]. In gauging self-efficacy, people assess their skills and capabilities to translate those skills into actions. Possessing skill can raise self-efficacy, which in turn can lead to further skill acquisition, but skill and self-efficacy are not synonymous in meaning. Students' own performances offer the most reliable guides for gauging self-efficacy. In general, success raises self-efficacy and failures lower it, although an occasional failure after some successes is unlikely to have much impact. How people act can often be predicted better by their self-efficacy (i.e. the beliefs about their capabilities) than by their actual skills [8]. Self-

efficacy also depends on students' intelligence and abilities. In general, high-ability students feel more efficacious about performing well than do low-ability students, but self-efficacy is not necessarily a direct reflection of students' intelligence and abilities.

## Methodology

### Study area

Woreilu is one of the 24 administrative districts in South Wollo Zone of Amhara Region. It is located at 36° 26' 0" – 39° 43' 0" E longitude and 10° 34' 0" -10° 60' 0" N latitude and 492 km far from Addis Ababa, Ethiopia, 571km from Bahir Dar, capital of Amhara Region, as well as 91km from Dessie, West of Zonal town. As of 2007 Ethiopia census, Woreilu town had a Population of 14,817 and 71013 hectare total area. According to the Agricultural and Rural Development office of the Woreda, agro-ecologically, the woreda is classified as "Dega" which accounts 82% while the remaining 18% is "Woina Dega". From the total number of 23 kebeles administrations 20 are rural. In the Woreda, most Kebeles produce crops in "Meher" season, six kebeles in both seasons and only one kebele in "Belg" seasons. The agro-climatic conditions of the Woreda ranged from moderate to high, with an average altitude of 2730m above sea level. Annual rainfall ranges from 766.2 to 1250mm. which is usually inadequate (short in duration), poorly distributed and highly variable in inter and intra seasons.

### Research design

This study was conducted using ex-post-facto research design, because it dealt with an already implemented treatment (self-efficiency beliefs). Momanyi et al. [25] Define the term ex-post facto as used in research to refer to an experiment in which the researcher, rather than create treatment, examines effects of naturally occurring phenomenon after the treatment had occurred. Therefore, the researcher noted the dependent variables, which is self-efficacy and academic performance and retrospectively studied the independent variables, gender and locality for its possible effects on the dependent variables. The variables in the study, by their nature could not be manipulated, for instance, gender is the characteristics, whether biological or socially influenced, by which people define male and female. However, the only control provided was to limit the response of students in Woreillu Secondary and Preparatory School.

### Population

The population of the present investigation was students in Woreillu Secondary and Preparatory School of grade 10<sup>th</sup> in the fall of 2017/18 academic year. The total number of students in the academic year under consideration is 473. Out of these students, 167 were feminine and 306 were masculine.

### Sampling

Students in Woreillu Secondary and Preparatory School grade 10<sup>th</sup> who originally came from different kebele were asked to voluntarily respond in a class survey in October 2017. One hundred ten students out of 473 enrolled in grade 10<sup>th</sup> were chosen using simple random sampling method and asked to participate in the study. All completed the surveys and the sample represented 23.3% of the population which was assumed to be sufficient condition as a sample to generalize to the whole population. Subjects included in the study were 45 (40.9%) females and 65 (59.1%) males. Moreover, I took 6 students (4 males, 66.7% and 2 females, 33.3%) available students for focus group discussion from the sample students in order to strengthen the value obtained from their self-efficacy surveys, mid examination and

achievement results.

### Tools for collecting the data

For the present investigation, the most important instrument for gathering useful information was the self-efficacy scale. The objectives of the tool in use were two folds. First, it is intended to collect some general information. Such as sex, locality, age etc, secondly, it purports to collect data to pertain the self-efficacy of towards chemistry in Woreillu Secondary School.

Self-efficacy scales are self-report confidential survey designed to measure how confident they are about performing and succeeding in particular situation [24]. The actual Likert scaling techniques provides five possible responses on each item. Students self-efficacy scale made up of five point Likert scale of strongly agree (SA), agree (A), neutral (N), disagree (DA) and strongly disagree (SD) corresponding to 5, 4, 3, 2, 1 point respectively for positive statement and 1, 2, 3, 4, 5 for negative statement was applied.

The items for self-efficacy scale in use were adopted (collected) from a validated questionnaire developed by [26] and constructed the surveys by considering the three domains of educational objective (cognitive, affective and psychomotor) at high school level, since students typically learn different subjects in different class rooms, items had been adapted to measure domain specific, goals and perceptions. Statements were phrased both positively and negatively to increase reliability and reduce apathetic answers. The survey was then critiqued by the school psychology teacher and other conceptual researchers'. Based on their feedback, it was determined that the instrument had adequate content validity for this study; No other measures of validity or reliability exist for this instrument. Moreover, by modifying the instruments that ended up with 15 self-efficacies test item.

Data on academic performance in Chemistry was collected by recording the score of the participants on the midterm and achievement tests. Thus, the mid and achievement scores in Chemistry was used as the measure of academic performance of students.

### Data collecting procedures

Before the study commenced, permission was sought and granted the teachers whose students would be surveyed, tested and interviewed. In addition to written direction, oral orientation is also conducted with the subjects to make everything vivid to them about the general information to be given while they are assigning their response. Three Chemistry teachers employed the activity of the whole process of administration. The survey was presented to students in opposite shift of their normal class time at the middle of October 2017. Because the survey contained an identifier, needed later in the study to match students' results to students' responses, signed consent forms were collected from individuals wishing to participate. The survey was then administered to the volunteers and took 30 minutes to complete. To ensure confidentiality and reduce researcher bias, no identifying information was given by students on the actual survey.

After the activities of felling the scale are completed, the dispatched scale was collected soon. Finally, after a careful analyzing of the proforma (questionnaire), no proforma was rejected due to insufficient information, wrong methods of answering etc. At last, all 110 proformas were found to be corrected to statistical analysis and interpretation.

### Method of data analysis

After the data were collected, negatively worded statement that were included to ensure reliability were recorded to positively worded

on total self-efficacy scores were calculated by summing the scores for all 15 likert items. The data then analyzed using appropriate descriptive and inferential statistics. Descriptive statics included in computing means, standard deviation, reporting number and percent for each demographic choice. t-tests were run to determine statistical significance and difference.

The mean and standard deviation applied to describe the characteristics of groups in general, and to deal with further statistical treatment like t-test. Since the mean is the most satisfactory measure for characterizing a group, researchers found it important to determine whether the difference between the means of the sample is significant. For this, the most appropriate device is the t-test. As the means of two groups randomly drawn from the sample were not necessary identical, any differences that appeared at the end is possibly attributed to sampling error. To test the difference in significant term, the device is known as t-test.

The last statistical device applied to the study was the product moment coefficient of correlation is used to correlate the relationship between two or more paired variables or set of variables or set of data. The degree of relation is measured and presented by Pearson product moment correlation coefficient. For all statistical test conducted in the study, the accepted error of the margin of the sample was 5% or  $\alpha = 0.05$  level of significance.

## Results

### Demographics

Approximately 110 students out of 473 enrolled in grade 10<sup>th</sup> were asked to participate in this study. All students completed surveys, which resulted in a response rate of 100%. Subjects included 41% females and 59%.

Demographic items measuring plan achieved in EGSECE, gender, age and locality produced multiple-choice data at the nominal scale of measurement. These items are described by number and percent of students reporting each choice. As observed in table 1 below, the sample was predominantly rural 65 (59%) and 65 (59%) male students. About 45 (41%) of students were urban and 45 (41%) of students were females. Roughly all the samples age were ranging from 16-19. And 8/11 (72.8%) of the samples were planned to score 'A', 2/11 (18.2%) were planned to score 'B' with greater level of confidence, no students planned to score below 'C' in Chemistry EGSECE in the fall of 2018 (Table 1).

Table 1: Reports of demographic data (N =110).

No.	Items	Frequency (N)	Percent
1	Gender		
	Male	65	59
	Female	45	41
2	Age		
	16	30	27.3
	17	40	36.4
	18	30	27.3
	19	10	9
3	Locality		
	Urban	45	41
	Rural	65	59
4	Plan achieved in EGSECE		
	A	80	72.8
	B	20	18.2
	C	10	9
	D	-	-
	F	-	-

### Self-efficacy

Survey questions 1 to 15 were like rt items reported on a 5-point scale (1= strongly disagree to 5 – strongly agree). These items measured self-efficacy level and included statements such as I am confident I can do well in Chemistry and I do not I will be successful in Chemistry. All statements are positively worded except for items 3, 6, 11 and 13, which word negatively worded to instrument reliability. Likert items produced numerical data of the ordinal scale of measurement. As given in table 2, Students agreed most with items 1, 2, 7 and 10. these item statements included: I am confident I have the ability to learn the material taught in Chemistry; I am confident I can do well in Chemistry; I believed that if I exert enough effort, I will be successful in Chemistry; and I am confident I can do well on the theoretical exams in Chemistry. Students disagree most with items 3 and 13, which states.

I do not think I will be successful in Chemistry; and I do not think I will get a good result (grade) in Chemistry. Moreover, there is high variation in level of self-efficacy among the participants ( $\delta = 1.2$ ) with item number 14 which states that I think I will successful in Chemistry forever (Table 2).

### Students levels of self-efficacy

The participants' self-efficacy was categorized in to high, moderate and low levels as presented in table 3. After reversing the numerical values for negatively worded statements (items 3, 6, 11 and 13), total self-efficacy scores were calculated by summing the scores for all Likert items. Scores could range from 15 to 75.

According to Diane et al. [26], scores greater than or equal to 60 were classified as high self-efficacy, scores from 31 to 59 were classified as moderate self-efficacy, and scores less than or equal to 30 were classified as low self-efficacy. Total self-efficacy scores for students in this study ranged from 32 to 75. The mean total self-efficacy score was 57.8, a score just below a high level of self-efficacy, the mode was 60 and the standard deviation was 8.12 (Table 3).

### Inferential statistics

**Gender differences in self-efficacy:** t-test was used to examine the relationship between total self-efficacy score and gender. The mean self-efficacy score was 59.72 for males and 55.89 for females. Standard deviations were 8.74 and 7.5 respectively. The t-test for independent samples was used to compare these two mean scores. The result of the analysis showed there was a significant difference in self-efficacy t

Table 2: Means and standard deviations for self-efficacy items.

Item Number	Mean ( $\bar{x}$ )	Standard Deviation ( $\delta$ )
1	4.45	0.50
2	4.0	0.91
3	2.0	1.06
4	3.7	1.02
5	3.8	0.61
6	2.25	1.12
7	4.5	0.93
8	3.3	1.06
9	3.2	1.17
10	4.0	0.92
11	2.15	0.94
12	2.2	1.2
13	1.95	1.00
14	3.7	1.20
15	3.4	1.00

(108) =2.46,  $P < 0.05$  (table 4). It was concluded that males have higher self-efficacy than females in Chemistry. However, the variation among males is self-efficacy is higher than females (Table 4).

**Self-efficacy differences based on locality:** A t-test was used to examine the relationship between total self-efficacy score and locality. As presented in table 5 and 6, the mean self-efficacy score was 57.6 for urban students and 57.9 for rural students with standard deviation were 7.41 and 6.45 respectively. Urban students collectively self-efficacy score was slightly lower than rural students were. A t-test for independent samples was used to compare these two mean scores. Result of the analysis indicated that there was no significance differences in self-efficacy  $t(108) = 0.3$ ,  $P < 0.05$ . It was thus concluded that urban and rural students of secondary school do not differ in Chemistry self-efficacy with little variation between them ( $\Delta\delta = 0.7$ ) (Tables 5 and 6).

**Gender and locality on academic achievement in chemistry:** One of the questions posed this study was to find out the influence of gender

**Table 3:** Anxiety-depression and complications of consumption.

Complication	Anxiety	Depression
History of overdose	p=0.43	p=0.42
Loss of control over consumption	p=0.29	<b>p = 0.031</b>
Feeling of craving	<b>p = 0.048</b>	p=0.19
Phenomenon of tolerance	<b>p = 0.014</b>	<b>p = 0.031</b>
Concentration disorders	<b>p = 0.048</b>	<b>p = 0.008</b>
Memory disorders	p=0.55	<b>p = 0.008</b>
Social disintegration	p = 0.28	p=0.65
Amotivational syndrome	p = 1	p=0.48

and locality on academic performance in Chemistry among grade 10<sup>th</sup> students. To achieve this objective the academic performance (i.e. midterm and achievement tests measuring academic performance) of the participants was obtained in raw scores were converted into standardized scores. The mean scores for male and female, urban and rural participants were calculated and presented in the table 7 below (Table 7).

To compare these two mean scores in academic achievement obtained by male and female, urban and rural participants, a t-test for independent samples was conducted. The results of the analysis indicated that there was a significant difference in academic performance between male and female students,  $t(108) = 1.13$ ,  $P < 0.05$  for achievement tests and urban and rural students,  $t(108) = 1.9$ ,  $P < 0.05$  and  $t(108) = 1.2$ ,  $P < 0.05$  for achievement test and mid-term results respectively. However, there was no significant difference in academic achievement between male and female students,  $t(108) = 0.4$  in midterm exams. It was concluded that boys and rural students performed better than girls did and urban students respectively in Chemistry but there were high variation in midterm and achievement test among rural students in both sexes in gross at all.

**Correlation between self-efficacy and academic achievement:** Midterm and achievement test results measuring academic achievement produced a numerical data at the interval level of measurement. Results then linked to survey data. To investigate the relationship between self-efficacy and academic performance among grade 10<sup>th</sup> students, participants' scores on self-efficacy and on academic achievement in

**Table 4:** t- test for male and female students (total mean efficacy).

Gender	Level of Self-efficacy			total	Mean	$\delta$
	Low	Moderate	High			
Male	-	35 (53.8)	30 (46.2)	65	59.72	8.74
Female	-	30 (66.7)	15 (33.3)	45	55.89	7.50
<b>total</b>	-	<b>65</b>	<b>45</b>	<b>110</b>	<b>57.8</b>	<b>8.12</b>

Note: Figures in parenthesis are percentages

**Table 5:** Participants levels of self-efficacy with locality.

Locality	Level of Self-efficacy			total	Mean	$\delta$
	Low	Moderate	High			
Urban	-	30	15	45	57.6	7.41
Rural	-	35	30	65	57.9	6.75
<b>total</b>	-	<b>65</b>	<b>45</b>	<b>110</b>	<b>57.8</b>	<b>7.1</b>

**Table 6:** t- test for male and female students (total mean efficacy).

Self-efficacy	locality	N	Mean	Standard deviation	Degree of freedom	t	Sign.(two tailed)
	Urban	45	57.6	7.41			
	Rural	65	57.9	6.75			

**Table 7:** Mean scores in academic achievement by gender and locality.

Gender	Frequency	Academic Achievement			
		Midterm		Achievement test	
		Mean	$\delta$	Mean	$\delta$
Male	65	59.20	20.6	50.2	15.9
Female	45	58.01	19.7	46.7	16.0
<b>total</b>	<b>110</b>	<b>58.61</b>	<b>20.2</b>	<b>48.95</b>	<b>15.95</b>
Locality					
Urban	45	58.5	21.5	48.3	13.8
Rural	65	64.4	28.2	53.9	16.5
<b>total</b>	<b>110</b>	<b>61.5</b>	<b>24.9</b>	<b>51.1</b>	<b>15.0</b>

Chemistry were correlated and the result is presented table 8 as follow (Table 8).

**Table 8:** Correlation coefficient between self-efficacy and academic achievement.

Academic Performance	Self-efficacy		
	Male	Female	total
Midterm	0.44	0.41	0.45
Achievement test	0.14	0.11	0.15

To determine the relationship between self-efficacy and academic achievement, a Pearson product moment correlation test was conducted. Using this test, total self-efficacy was compared with both midterm and achievement test results. Based on the results of the analysis in table 5, highly significant positive relationships were found between total self-efficacy and midterm results ( $r(108) = 0.41, P > 0.05$ ) and total efficacy and achievement test results ( $r(108) = 0.15, P > 0.05$ ) in both sexes.

Correlation between self-efficacy and midterm exam for females only becomes  $r(45) = 0.41$ , which statistically significant at 0.05 and self-efficacy and achievement test be  $r(45) = 0.11$ , which is also too. By the same token correlation between self-efficacy and midterm exam and self-efficacy and achievement results for males becomes only be  $r(65) = 0.44, P > 0.05$  and  $r(65) = 0.14, P > 0.05$  respectively. Therefore, a positive relationship existed between self-efficacy and academic achievement in Chemistry.

**Summary of interview's responses:** To strengthen the response given by the students and teachers through the questionnaires 2 structured interview questions that were directly related to the study were designed and conducted with 4 male and 2 female students from the subject of the study to increase the reliability of the study.

**Interview with female students:** To begin with the first interview the questions asked was "Do you think that you are confidential as boys and scored good results in Chemistry equal to boys?" to this end, female students responded that they do not think they are confidential and have good performance as that of boys. As they forwarded their reasons, they are less motivated due to parents' influences as their parents think that they send the female students after completing grade 10<sup>th</sup> for domestic works and sources of income. They also added that economic problems of their parents made them (to):

- Think about going to Arab countries always
- Antipathy to school or disinterest in learning
- Develop hopelessness
- Lose vision in education
- Lack of readiness to study, learn ....

#### Interview with urban students

The question posed was "Do you think that you are confidential land scored good results as that of rural students in similar fashion in Chemistry?" In this, question urban students responded that they are definitely confidential as that of rural students in any aspect. Besides this, they agreed that they might have a difference in academic performance. They put forward their reasons as:

- Improper use of time, as the influence of western culture such as films, soccer's, pool and billiard-games poses a challenge for their time to spend without any significant results.

- Absenteeism from school
- Lack of concentration and attention during study
- Low habit of studying in libraries

## Discussion and Recommendations

The purpose of this study was to document student self-efficacy, also called perceived ability in Chemistry at Woreillu Secondary School. This study also documented whether there were differences in self-efficacy based on gender and locality and whether self-efficacy related with Chemistry achievement. Academic performance was measured using midterm and achievement test results.

### What are the levels of self-efficacy for grade 10<sup>th</sup> students in Chemistry?

This study measured the levels of self-efficacy of students at the halfway of the school term. Results obtained showed that most students had moderate to high self-efficacy levels. Students' total self-efficacy scores ranged from 32 to 75. A score of 75 was the highest possible level of self-efficacy. No students received the lowest possible score of 15. The lowest score (32) reported in this study come to a moderate level of self-efficacy since moderate levels of self-efficacy ranging from 31 to 59. The grand mean score on self-efficacy for all participants was 57.8, a score slightly below a high level of self-efficacy.

There were no gender differences in the levels of self-efficacy. Pintrich et al. [27] documented that female students have lower self-efficacy levels in science such Chemistry compared to male students, contrary to the present study. It is possible that in our culture the sex role stereotypes undermine females to participate actively in the field of education in general and in Chemistry classes at particular by reifying men's ability. Nevertheless, these results support the self-efficacy theory, which states that individuals attempt tasks in which they believe they will be successful. Students who possess higher self-efficacy are more successful in school, whereas those who lack believe and abilities for success became inefficient and may avoid higher education altogether [24].

### Is there a difference in self-efficacy for students based on gender?

In this study, the females' mean self-efficacy score (55.89) was lower than males' (59.72) in which gender differences were evident in Chemistry self-efficacy. Boys scored higher than girls did in Chemistry self-efficacy. t-test computations to test the hypothesis revealed significant gender differences, similar to the studies which reported gender differences in science self-efficacy at the secondary school level [27-29].

Authors [15,26] found that both female and male students had no significant differences in science self-efficacy, which contradicts the present investigation. However, self-efficacy can change over time [30]. the rationale behind for the difference in self-efficacy between sexes may be that females usually undermine themselves to participate actively in Chemistry for some culture reasons. In addition to this, teachers treat girls and boys differently in Chemistry class (Harvard University).

Self-efficacy is especially important in learning challenging subjects like Chemistry given that students enter courses with varying levels of

fear and anxiety. Baldwin et al. [31] noted that self-efficacy becomes significant over the duration of a course as science concepts increasing complexity. According to Kennedy et al. [32] science self-efficacy affects science learning, choice of science, amount of effort exerted and persistence in science.

### **Is there a difference in self-efficacy between urban and rural students in both sexes?**

No research studies were found in the literature that compared self-efficacy between urban and rural students in both sexes. In this study, the mean total self-efficacy of urban students were lower than rural students in both sexes but the differences were not significant  $P=0.2$ . This result was unexpected. This research thought that rural students who have not good living standard, parent as follow-up & enough facilities scored lower on self-efficacy than urban students who have enough accesses & facilities in every respect.

The possible explanation for the result is that the living styles, difficulties faced during their lifetime makes the rural students to be risk takers, optimistic and visionary.

### **Is there a difference in academic achievement between males and females?**

This study found that boys out performed girls in Chemistry. Contrary to assertions by [33] that girls or women's performance in sciences is actually equal with boys or men's. But the result is similar to the studies which reported implies that male students outperform female students significantly in Chemistry test results at the secondary school level [24]. Gender difference in academic achievement in Chemistry is supported by the findings of the study. However, research show that girls tend to perform well in science such as in Chemistry when they taught by female teachers [25]. As informed by observational learning theory, female teachers can provide positive support female students through vicarious reinforcement to improve their self-efficacy and academic achievement. According to the above discussion, students' achievement is highly related to their inbuilt self-efficacy.

### **Is there a difference in academic achievement between urban and rural students in both sexes?**

Despite the self-efficacy of both urban and rural students are similar, rural students significantly outperformed urban students in Chemistry achievement scores. Similarly [34,35] which revealed that rural students had shown better performance in all the school subjects as compared to their urban classmates. By contrast, some research findings such as [36] have shown that pupils from urban areas had better achievement results than rural pupils.

The plausible explanation for the present investigation result is that urban students may have influence of western culture (such as film, watching soccer's, spending their time in pool & billiard games ...), absenteeism from school, lack of basic study skills, concentration, improper use of time and inability to handle materials necessary in the examination is raised in the focus group discussion. Moreover, [37,38] emphasizes the influence of locality on achievement of science subjects as it has a pronounced effect on the reading, preparation, readiness of high school students.

### **What kind of relation is there between the score of self-efficacy and score of Chemistry achievement?**

The Pearson Product moment correlation coefficient showed a

significant positive relationship between self-efficacy and academic performance for both boys & girls. It can therefore be argued that schools could improve academic performance of their students by boosting their self-efficacy. The challenge posed to educators is to identify ways through which the self-efficacy of both male and female students can be enhanced for better academic performance.

### **Conclusion**

This study has investigated the level of students' self-efficacy and their achievement in chemistry and identified the difference in self-efficacy and achievement between the males and females, urban and rural students and determines relationships between the two variables. The total students' mean self-efficacy level is found to be medium (57.8). The mean score of their achievement in chemistry test is 53.75. Both males and females have significant difference in self-efficacy. However, locality do not have an influence on students' self-efficacy. In addition, it was investigated that because of self-evaluation in class participations and knowledge of high school's norm referenced evaluation system, female students had developed a fear of not getting better results, which entirely would affect their achievement in chemistry test. The study also revealed that rural students outperform urban students in both sexes in Chemistry because they have relatively good study skills, abilities and persistence than urban students.

In addition, their self-efficacy and achievement are positively and significantly related. Since student self-efficacy beliefs were found to be significantly and positively related to their achievement in chemistry in this study, the importance of self-efficacy's influence on academic performance in science fields cannot be underestimated. According to Bandura, efficacy beliefs partly shape the courses that lives take. Therefore, as student self-efficacy and academic achievement are highly connected, educators and counselors should identify students with low self-efficacy and then implement methods to raise the low student self-efficacy levels.

### **Recommendation**

Because of the significant link between self-efficacy and academic performance in chemistry, it is highly recommended that educators and counselors assess the existing levels of self-efficacy in students. If lower levels of self-efficacy are identified, then appropriate measures should be taken to help raise student self-efficacy levels. Enactive mastery experience, vicarious experience, verbal persuasion, and physiological and emotional states, which are the primary factors that determine self-efficacy, are prime targets on which educators and counselors should focus their efforts. Classroom teachers use additional areas that can be addressed to help increase student self-efficacy include goal-setting, reward, and active learning.

To minimize the potential negative consequences of physiological and emotional states on self-efficacy, techniques that help lower anxiety, reduce stress, teach relaxation, and teach positive self-talk should be taught to students who suffer adverse consequences of hyperactivity and high anxiety.

Finally, the use of active instructional methods in the classroom increases student confidence and is strongly encouraged. Active instruction moves from teacher-centered classrooms where lecture is the primary delivery method to learner-centered classrooms where an array of instructional techniques are utilized to actively involve the students. A variety of instructional methods is most likely to reach a diverse audience of learners. Active learning also shifts the student

from a passive role to an active one. Active learning is involved in other aspects of learning since it increases students' critical thinking skills, comprehension, information retention, motivation, and success.

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