

**ANALYTICAL SURVEY OF STUDENTS' ATTITUDES TOWARDS
TEACHING AND LEARNING OF MATHEMATICS AND CHEMISTRY IN
SENIOR SECONDARY SCHOOLS IN EMOHUA EDUCATION ZONE**

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Abstract

This study analysed senior secondary one (SS1) students' attitudes towards learning of Mathematics and Chemistry in selected senior secondary schools in Emohua education zone of Rivers state, Nigeria. Analytic survey design was used. Four research questions and two hypotheses guided the study. The instruments used for data collection were questionnaires titled: Attitudes towards Mathematics scale (ATMS) and Attitudes towards Chemistry scale (ATCS) which were adapted from (Abdul Majeed, Darmawan and Lynch, 2013). The instruments measured four domains: motivation, value, self-confidence and enjoyment. The instruments were face and content validated by three experts from the department of Curriculum Studies and Educational Technology University of Port Harcourt. Cronbach Alpha was used to determine the reliability of the instruments. Reliability coefficient indexes of 0.89 for ATMS and 0.91 for ATCS were obtained. Research questions were answered using mean and standard deviation whereas hypotheses were tested using t-test at 0.05 Alpha level of significance. The findings revealed a general negative attitude towards Mathematics and Chemistry among SS1 students in Emohua education zone. The study also revealed that gender disparity has no impact on the attitude of SS1 students towards Mathematics and Chemistry as both male and female students had the same type of attitude towards Mathematics and Chemistry. Based on the findings the following recommendations among others were made: Mathematics and Chemistry in the secondary school should be taught by Mathematics and Chemistry specialist teachers only since non-specialist teachers do not display positive attitude towards the subjects.

Key words: Mathematics, Chemistry, students' attitude, teaching-learning

Introduction

It is not an exaggeration that Mathematics and Chemistry are among the basic tools for economic growth, national development and the backbone of any nation's progress. Research evidence has proved that Mathematics and Chemistry contribute to quality of life and national buildings in all aspects (Festus and Ekpete, 2012). They are among the science subjects that technological break-through is built on as well as the hub where the wheel of science rotates. Moreover, Mathematics and Chemistry equips the learner with the ability, experience, and confidence to venture into different fields of human endeavors such as medicine, agriculture, transportation, housing, industries and so on; furthermore, the knowledge of Mathematics and Chemistry facilitates knowledge in other fields which fuel national development. Mathematics and Chemistry is among the most important disciplines in the school curriculum as well as in the development of a nation, the mind and in underpinning the study of other subjects, their importance in the general education has gained world-wide recognition (Ejidike and Oyelana, 2015).

According to United Nations (2012), Mathematics and Science Education are pillars for economic growth and national development. Mathematics, science (Chemistry) and technology enhance the prosperity of any society and without them the resources of our nation cannot be structured for industrial growth and development. Nigeria cannot attain any reasonable level of national development without meeting the vital indices of development particularly, in area of Mathematics and Mathematics. Mathematics and Chemistry affects all aspects of human life at different levels. They are used as basic entry requirements into any of the prestigious courses such as medicine, geophysics, astrophysics, architecture, geology, and engineering among others. Regrettably, this all important subjects are the most boring dreaded, poorly taught, widely hated and abysmal to understand in our school system especially at the secondary school level. The worst of all is that most students still see Mathematics and Chemistry as not important to their future and field of study. The heart of the matter is that most of the students in our secondary schools are noted for having problems learning mathematics and the Sciences especially Chemistry.

The unpopularity of Mathematics and Chemistry in our school system can be due to a number of reasons ranging from psychological, social and cultural. Besides, several factors have been identified for students' poor performance in mathematics and chemistry. These include but not limited to students' attitudes and interests towards the subjects; their temperament towards predilection or abhorring the subject (s). The truth is that teachers' attitude and motivation towards their subject play a critical role in the teaching and learning process and generally influence students' attitudes towards the subject; they play a major role in shaping the classroom environment which has an impact on a student's self-efficacy which in turn influences a student's behaviour (Ogembol, Otanga and Yaki, 2015); and also influence the ways they organize the content to teach and the teaching approaches they use in the classroom (Azuka, et al, 2013); but students' attitude towards a subject is by far one of the most influential variables that determine achievement and that is why the researchers investigated students' attitudes towards Mathematics and Chemistry in selected senior secondary schools in Emohua education zone of Rivers state. Attitudes can distort students' perception of information and affect their degree of retention.

Aremu and Sokan, (2000) in Unanma, Abugu, Dike and Umeobika (2013) posited that different people at different times have passed the blame of poor performance in secondary school to teaching and learning environment as well as students attitudes and interest in the subject, which implies that even if teachers may have positive attitude, they are beset with problems that frustrate their efforts to teach effectively and efficiently. The indispensable role of attitude in the learning of Mathematics has garnered the attention of educational researchers and Mathematics educators for a very long time (Mensah, Okyere and Kuranchie, 2013).

A study on the attitudes of the students towards a particular subject has shown that achievement in that subject, or any other subject, is determined by one's attitude towards the subject rather than one's attitudes being determined by one's achievement in the subject Chepkorir (2013). According to Miranda (2012); Sakiz, Pape, & Hoy, (2012) attitudes of students towards a particular subject does not only encourage their involvement and commitments in the teaching and learning process but affect their performance as well. Research revealed that positive attitudes are conducive to good achievement in any subject Senthamarai, Sivapragasam and Senthilkumar (2015).

Jain (2014) stated that attitudes are relatively lasting clusters of feelings, beliefs and behavior tendencies, directed towards specific persons, ideas, objects or groups. Psychologists define attitude as learned tendency to evaluate things on certain ways including people, issues, objects and events (Cherry, 2015); Cherry (2015) reiterated that such evaluations are often positive or negative or uncertain at times.

Han and Carpenter (2014) stated that attitudes consist of cognitive, affective and behavioral reactions that individuals display towards an object or the surrounding based on their feelings or interest. Han and Carpenter (2014) recapped that affections is person's emotions, feelings and moods towards object, behavioral is person's past and future activities towards object) whereas cognitive is person's thought and beliefs about object. Students' attitudes are intrinsic and it is developed over a period of time, it is as a result of experiences (Abdul Majeed, Darmawan and Lynch, 2013). If the students' experience with a subject is negative and not successful, it is more likely that his/her attitude towards that subject will be negative and vice versa. In the present study, attitude towards mathematics and chemistry were investigated from a position of four components (Abdul Majeed, Darmawan and Lynch, 2013):

- i. Mathematics and Chemistry self-confidence which is students expectation of being good or not in mathematics or chemistry, being able to learn and solve Mathematical or Chemistry problem.
- ii. Mathematics and chemistry value which is students' believes about mathematics and Chemistry as worthwhile, necessary and important subjects.
- iii. Mathematics and Chemistry motivation which is students' willingness to study mathematics or chemistry beyond the compulsory level.
- iv. Enjoyment of mathematics or chemistry which is student's level of comfort and happiness during mathematics or chemistry study.

Statement of the problem

The researchers are not only baffled but wondering why the performance of senior secondary school students in Mathematics and Chemistry has remained persistently low despite the efforts made by the government and the subject teachers to improve the teaching of these subjects at the secondary school level. The successfulness of learning a subject is contingent on many factors prominent among them is students' attitude towards the subject. Students' attitude plays a focal role in the teaching learning process. It makes the teaching of Mathematics and Chemistry ineffective even where there are competent teachers to teach. The attitude of students themselves contributes enormously towards their perception about a subject as well as helps them to develop the adaptability and applicability in that subject. It is on this premise that this study is designed to investigate the attitude of SS1 students towards learning Mathematics and Chemistry so that the government and teachers among others could see the attitudes of SS1 students in Emohua Education zone towards Mathematics and Chemistry and then make serious efforts to develop and design programs that will sustain their positive attitude towards both subjects.

Aim/Objectives of the study

The aim of the study was to investigate SS1 students' attitudes towards Mathematics and Chemistry in Emohua Education zone of Rivers state, the specific objectives were to:

1. determine the general attitudes of senior secondary one (SS1) towards Mathematics and Chemistry;
2. compare the attitude of male and female students in Mathematics and Chemistry;
3. examine the gender difference with respect to Mathematics self-confidence at senior secondary school level, and
4. investigate the gender difference with respect to Chemistry self-confidence at senior secondary school level.

Research Questions

The following research questions guided the study:

1. What is the general attitude of senior secondary one (SS1) students towards Mathematics and Chemistry?
2. What are the attitudes of senior secondary one (SS1) students towards mathematics and Chemistry with respect to gender?
3. What is the difference between the attitude of male and female students with respect to Mathematics self-confidence of senior secondary one (SS1) students?
4. To what extent is the attitude of male students different from that of the female students with respect to Chemistry self-confidence?

Hypotheses

HO₁: There is no significant difference between male and female SS1 students with respect to mathematics self-confidence at senior secondary school level

HO₂: There is no significant difference between male and female SS1 students with respect to Chemistry self-confidence at senior secondary school level.

Methodology

Analytic descriptive survey design was used for the study as it uses both research questions and hypotheses to arrive at results (Nwankwo, 2016).

The population consisted of two thousand, two hundred and twenty six (2226) SS1 students in public senior secondary schools in Emohua education zone of Rivers State. Stratified random sampling was used to get the sample of 326 students (171 males & 155 females) from six senior secondary schools in Emohua education zone of Rivers State.

The instruments for data collection were questionnaires titled: Attitudes towards Mathematics scale and Attitudes towards Chemistry scale adapted and modified from (Abdul Majeed, Darmawan and Lynch, 2013). The attitudes scale for each instrument consisted of 38 items designed to measure four subscales (attributes): enjoyment of mathematics and chemistry (items 1-10), self-confidence (items 11-20), value of mathematics and chemistry (items 21-29) and motivation to learn mathematics and chemistry (items 30-38). Students were asked to respond to a series of statements for each of Mathematics and Chemistry using a four-point Likert scale of Strongly agree (SA coded 4), Agree (A coded 3), Disagree (D coded 2) and Strongly disagree (SD coded 1). The instrument is made up of both positively and negatively skewed items. The negatively skewed items were scored in reverse order. Research questions were answered using mean and standard deviation. The criterion mean for both the questionnaire was determined by $\frac{4+3+2+1}{4} = 2.5$. Hence, the mean of 2.5 and above ($x \geq 2.5$) was considered positive, whereas mean below 2.5 ($x < 2.5$) was considered negative. Hypotheses were tested using t-test at $\alpha = 0.05$ level of significance.

The instruments were face and content validated by three experts from Department of Curriculum Studies and Educational Technology University of Port Harcourt. Cronbach Alpha was used to determine the reliability of the instruments. Reliability coefficient indexes of 0.89 for ATMS and 0.91 for ATCS were obtained.

Results and discussion

The results of each question were presented on different tables and were analyzed using mean and standard deviation:

Research Question 1: What is the general attitude of senior secondary one (SS1) students towards Mathematics and Chemistry?

Table 1: summary of SS1 students' general attitude towards Mathematics and Chemistry

| Attitude Domains | Mathematics | | | Chemistry | | |
|------------------|-------------|----------|----------|-----------|----------|----------|
| | Mean | Std. Dev | Decision | Mean | Std.Dev. | Decision |
| Enjoyment | 2.38 | 1.08 | N | 2.42 | 0.98 | N |
| Self-confidence | 2.47 | 0.97 | N | 2.54 | 0.96 | P |
| Value | 2.31 | 1.00 | N | 2.25 | 0.97 | N |
| Motivation | 2.43 | 1.04 | N | 2.31 | 0.96 | N |
| Grand mean | 2.40 | 1.02 | N | 2.38 | 0.97 | N |

Source: Researchers' field work (2017); Criterion mean=2.5; $\bar{X} \geq 2.5$ is positive; $\bar{X} < 2.5$ is negative
 **N=negative, ** P= positive

Table 1 gives a summary of the data obtained from the analysis of students' attitude towards learning Mathematics and Chemistry. The result shows that students' attitude towards learning Mathematics were negative in all the attitude domains: enjoyment, self-confidence, value and motivation. The result also shows that the students' attitude towards learning Chemistry were negative in all the attitude domains except in Chemistry self-confidence with the mean of 2.54 ± 0.96 . The grand mean of 2.40 ± 1.02 for Mathematics and 2.38 ± 0.97 for Chemistry shows that their attitude towards learning Mathematics and Chemistry were both negative.

Research Question 2: What are the attitudes of senior secondary one (SS1) students towards mathematics and Chemistry with respect to gender?

Table 2: summary of SS1 students' attitude towards Mathematics and Chemistry with respect to gender

| Attitude Domains | Sex | N | Mathematics | | | Chemistry | | |
|------------------|--------|-----|-------------|-----------|----------|-----------|-----------|----------|
| | | | Mean | Std. Dev. | Decision | Mean | Std. Dev. | Decision |
| Enjoyment | Male | 177 | 2.28 | 0.94 | N | 2.25 | 0.87 | N |
| | Female | 155 | 2.16 | 0.80 | N | 2.32 | 0.84 | N |
| Self-confidence | Male | 177 | 2.44 | 0.88 | N | 2.40 | 0.87 | N |
| | Female | 155 | 2.43 | 0.86 | N | 2.40 | 0.89 | N |
| Value | Male | 177 | 2.10 | 0.83 | N | 2.18 | 0.78 | N |
| | female | 155 | 2.34 | 0.87 | N | 2.35 | 0.83 | N |
| Motivation | Male | 177 | 2.24 | 0.88 | N | 2.38 | 0.79 | N |
| | Female | 155 | 2.32 | 0.80 | N | 2.34 | 0.85 | N |
| Grand mean | Male | 177 | 2.27 | 0.88 | N | 2.30 | 0.83 | N |
| | Female | 155 | 2.31 | 0.83 | N | 2.35 | 0.85 | N |

Source: Researchers' field work (2017); Criterion mean=2.5; $\bar{X} \geq 2.5$ is positive; $\bar{X} < 2.5$ is negative

**N=negative, ** P= positive

Table 2 gives a summary of students' attitude towards Mathematics and Chemistry with respect to gender. The table indicates that all the attitude domains (enjoyment, self-confidence, value and motivation) were negative in both Mathematics and Chemistry. The grand mean for male in Mathematics and Chemistry were 2.27 ± 0.88 and 2.30 ± 0.83 , whereas, that of female were 2.31 ± 0.83 and 2.35 ± 0.85 respectively. This implies that the attitudes of both male and female students towards learning Mathematics and Chemistry were negative.

Research question 3: What is the difference between the attitude of male and female students with respect to Mathematics self-confidence of senior secondary one (SS1) students?

Table 3: summary of the difference between male and female SS1 students' attitude with respect to Mathematics self-confidence

| Attitudes Domains | Sex | N | Mean | Std. Dev. | Decision |
|-------------------|--------|-----|------|-----------|----------|
| Self-confidence | Male | 171 | 2.44 | 0.88 | N |
| | Female | 155 | 2.43 | 0.86 | N |

Source: Researchers' field work (2017); Criterion mean=2.5; $\bar{X} \geq 2.5$ is positive; $\bar{X} < 2.5$ is negative

**N=negative; ** P= positive

Table 3 outlined the data obtained from the analysis of the difference between male and female students' attitude towards Mathematics self-confidence. The table indicates that both male (2.44 ± 0.88) and female (2.43 ± 0.86) students' attitude in Mathematics self-confidence was negative.

Research question 4: To what extent is the attitude of male students different from that of the female students with respect to Chemistry self-confidence?

Table 4: summary of the difference between male and female SS1 students' attitude with respect to Chemistry self-confidence

| Attitudes Domains | Sex | N | Mean | Std. Dev. | Decision |
|-------------------|------|-----------|----------|-----------|----------|
| Self-confidence | Male | 171 | 2.400.87 | N | |
| Female | 155 | 2.400.89N | | | |

Source: Researchers' field work (2017); Criterion mean=2.5; $\bar{X} \geq 2.5$ is positive; $\bar{X} < 2.5$ is negative
 **N=negative; ** P= positive

Table 4 gives a summary of the data obtained from an analysis of male and female students' attitudes with respect to Chemistry self-confidence. The table indicates that both male (2.40 ± 0.87) and female (2.40 ± 0.87) students' attitude in Chemistry self-confidence was negative. This implies that there was no gender disparity towards Chemistry self-confidence.

H_{O1} : There is no significant difference between male and female SS1 students with respect to Mathematics self-confidence at senior secondary school level.

Table 5: Summary of independent sample t-test between male and female SS1 students Mathematics self-confidence at senior secondary school level

| Gender | N | Mean | SD | df | t-cal | p-value | Decision |
|--------|-----|------|------|-----|-------|---------|----------|
| Male | 171 | 2.44 | 0.87 | | | | |
| Female | 155 | 2.42 | 0.89 | 324 | 0.706 | 1.96 | Retained |

Not sig. at .05

Table 5 shows the summary of independent sample t-test on the difference between male and female SS1 students with respect to Mathematics self-confidence at senior secondary school level. It shows that the mean of male students was 2.44 ± 0.87 and that of female students was 2.42 ± 0.89 . The result shows that there is no significant difference between male and female students with respect to Mathematics self-confidence at senior secondary school level ($t, 324 = .706, p < .05$). The null hypothesis one was retained at .05 alpha level.

H_{O2} : There is no significant difference between male and female SS1 students' attitudes with respect to Chemistry self-confidence at secondary school level.

Table 8: Summary of independent sample t-test in confidence between male and female SS1 students towards chemistry at secondary school level

| Gender | N | Mean | SD | df | t-cal | p-value | Decision |
|--------|-----|------|------|-----|-------|---------|----------|
| Male | 171 | 2.40 | 0.88 | 324 | 0.701 | 1.96 | Retained |
| Female | 155 | 2.40 | 0.86 | | | | |

Not sig. at .05

Table 8 shows the summary of independent sample t-test on the difference between male and female SS1 students with respect to Chemistry self-confidence at senior secondary school level. It shows that the mean of male students was 2.40 ± 0.88 and that of female students was 2.40 ± 0.86 . The result shows that there is no significant difference between male and female students with respect to Chemistry self-confidence at senior secondary school level ($t, 324 = .701, p < .05$). The null hypothesis two was retained at .05 alpha level.

Discussion of findings

The findings of this study showed that the general attitude of the students towards mathematics and chemistry were both negative. The results also revealed that both male and female students' attitude towards Mathematics and Chemistry were negative. The result also revealed that there is no significant difference between male and female SS1 students' attitudes with respect to Mathematics and Chemistry self-confidence in secondary school in Emohua education zone. The negative attitudes of the students may not be unconnected to lack of interest, erroneous beliefs that Mathematics and Chemistry is hard and poor motivation by teachers. Gender disparity has no impact on the attitude of students towards mathematics and chemistry self-confidence.

This findings is in line with (Abosalem, 2015; Adebule and Aborsade, 2014; Mata, Moteiro and Peixoto, 2012) who posited that attitudes towards Mathematics did not significantly differ in male and female students. According to them male and female students had the same type of attitudes towards mathematics. Farhana, & Zainun, (2012) investigated Urban students' attitude towards Learning Chemistry found that the students have a negative attitude towards

learning chemistry because of the subject itself. Majority of the students claimed that chemistry is not their favourite subject in school.

This result is however in contrast with the findings of Owiti, (2011) who found that significant gender differences existed between male and female students towards mathematics, in his study, Student's sex and attitudes towards mathematics, boys had a higher positive attitude towards mathematics than girls. Senthamarai, Sivapragasam and Senthilkumar (2015) investigated attitude of secondary school students towards mathematics. The result showed that the secondary school, female students has a better attitude towards mathematics than that of male students.

Cheung (2009) conducted a comprehensive review of the literature regarding gender issues related to chemistry education; the study revealed that in some cases girls exhibited more positive attitude towards chemistry and in other cases, the opposite picture prevailed. The result showed that the secondary school, female students has a better attitude towards mathematics than that of male students.

Summary of findings

1. Most students have negative attitude towards learning Mathematics and Chemistry.
2. Male and female SS1 students in senior secondary schools in Emohua Education zone have same type of attitude towards mathematics and chemistry.
3. Gender disparity has no impact on the attitude of SS1 students towards mathematics and chemistry.
4. There is no significant difference in attitudes towards mathematics and chemistry self-confidence with respect to gender.

Conclusion

Based on the findings of this study, it was concluded that a conscious effort on the part of the teachers, parents and government can bring about a constructive change in the students' attitude towards mathematics and chemistry.

Recommendations

In the light of the above findings, the researchers wish to make the following recommendations:

1. Mathematics and Chemistry in the secondary school should be taught by Mathematics and Chemistry specialist teachers only since non-specialist teachers do not display strong interest in the subjects.
2. Mathematics and Chemistry laboratories should be built and properly equipped. This will help the mathematics and chemistry teachers make their teaching real to students.
3. Mathematics and Chemistry teachers should be giving positive reinforcement to students who make efforts in Mathematics and Chemistry work. This will make other students put more efforts in learning the subjects.

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