

## STUDENTS' MOTIVATION AND ACADEMIC ACHIEVEMENT IN CHEMISTRY

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### **Abstract**

*This study investigated students' motivation and their academic achievement in senior secondary school chemistry in Obio/Akpor Local Government Area of Rivers State. Also, the influence of gender on the academic performance of students was examined. The research was quasi- experimental pretest-posttest control group design. Two research questions guided the study and two hypotheses were tested. The instrument used to elicit response for the study was a class test to compare performance of students motivated (experimental group) and students unmotivated (control group) for the two schools selected. The population of the study was 2000 students. The sample for the study comprised 200 Chemistry students (100 male and 100 female) from two public senior secondary schools in Rivers state, Nigeria. The technique for the sample selection was random assignment of intact classes to sample groups. Data collected were analysed using both descriptive (mean and standard deviation) and inferential statistics (Analysis of Covariance, ANCOVA). The statistical significance of the hypotheses was tested at  $\alpha = 0.05$ . The findings of "the study showed that the academic achievement of motivated students were better than their counterparts. However, there is significant difference in the motivated and unmotivated students. Gender does not have significant effect on mean achievement score of motivated students in chemistry. Based on the research findings, recommendations were made on the need for Chemistry teachers to use instructions that are innovative, activity-based and student-centred in order to engage students for a better academic upliftment also, Modern facilities and technologies should be provided by the Government as instructional materials for effective teaching of chemistry in schools.*

### **Introduction**

The growth or advancement of many nations of the world depends on her scientific and technological development. Science is so valued in our society by reason of the application of scientific knowledge to satisfy many basic human needs and improvement of living standards. Chemistry is a branch of physical science concerned with the study of the composition, structure, changes and properties of matter. Our body is made up of chemicals and reactions when we read, talk, walk, work, breathy and eats. Aaron (2013) reported that Chemistry is the study of everything about matter and therefore knowing Chemistry helps us make our day-to-day decisions that affect our life and professions.

Despite the enormous importance of Chemistry, students still perform poorly in Chemistry at secondary school level (Nbina, 2011 & Alozie, 2012 cited in Wagbara, 2015).

Also, the importance of Chemistry has made it necessary to be included in the nations secondary school curriculum. Nevertheless, Gyimal (2012) said that people constitute the only asset that can work towards an organizational goal. Hence, the challenge of educational administrators and managers of schools is to have highly motivated students who are engaged in meaningful learning for good academic performance.

Motivation is the most important aspect of human behavior in educational psychology. According to Tohidi (2012), it is the most important topic in industrial and organizational management. Motivation has both psychological and social aspects that are used to direct and control the behavior of an organism. It stimulates the behavior of human beings. Furthermore, motivation is a strong force directing students to put in efforts for their academic achievements. Motivation helps students to achieve high levels of academic performance. It can be basic recipe for academic success. It involves both intrinsic and extrinsic factors. Intrinsic motivation is an internal factor that exists in an individual which drives an interest or enjoyment. "Students are likely to be intrinsically motivated if they attribute the educational results to factors under their control (Tohidi, 2012). Extrinsic motivation is an external factor that comes from outside the individual.

This type of motivation is demonstrated in the study of operant conditioning. Cherry (2019) stated that operant conditioning is a method of learning that occurs through rewards and punishments for behavior. Examples of extrinsic motivation are rewards like the use of words (Good, very good, excellent etc), money, grades and threat of punishment. Intrinsic motivation is the desire to do or achieve something because one truly wants to and takes pleasure or sees value in doing so. Extrinsic motivation is the desire to do or achieve something not for the enjoyment of the thing itself, but because doing so leads to a certain result (Pintrich, 2003). Furthermore, extrinsic motivation can be internalized by the individual if the task fits their values and beliefs hence, their basic psychological needs can become fulfilled. A number of studies have demonstrated that both intrinsic and extrinsic motivation influence a student's self-efficacy on academic performance (Wu, Zheng & Guo, 2020). Students need four major factors in order to be motivated. Researchers agreed that students need to have these factors in order to be motivated and they includes; competence, autonomy, control, interest/value and relatedness (Center for Education Policy, 2012).

Motivation can be one of the factors that enable students to efficiently carry out their educational duties. It is a crucial part of students' academic success. It can affect how students approach school activities generally, relate to teachers, seek support from their teachers and peers, and they show greater heights in their studies and so on. Center for Education Policy (2012), reported that lack of motivation could be a real problem that can affect a large percentage of students as well as the school environment. Chemistry students are discouraged from learning, put little effort in school work and feel bored in school, if there is no motivation in the learning motivation has serious contributions that can prevent students from dropping out of school (Tohidi, 2012).

Haralambos and Holborn (2018) defined theory as a set of ideas that tends to explain phenomenon. Therefore, this study was discussed using the Cognitive Social Learning Theory (CSLT). The theory was credited to Albert Bandura (1977). It is concerned with motivational factors (intrinsic and extrinsic factors) and self-regulatory mechanisms that contribute to acquisition of behaviour. Thus, the immense importance of motivation made it pertinent for

this study to investigate the effect of motivation on students' academic achievement in Chemistry.

### Purpose of the Study

The study sought to investigate students' motivation and their academic achievement in Chemistry.

Specifically, the study determined

- Effect of motivation on students' academic achievement in chemistry.
- Gender effect of motivation on students' academic achievement in Chemistry.

### Research Questions

1. What are the achievement mean scores of motivated and unmotivated students in chemistry?
2. What are the mean scores of male and female motivated students in chemistry?

### Hypotheses

The following null hypotheses which were tested at 0.05 level of significance guided the study:

1. There is no significance difference between the academic achievement of motivated and unmotivated students in chemistry.
2. Gender does not have significant effect on mean scores of motivated students in chemistry.

### Methodology

The quasi-experimental research design was adopted for the study. The population of the study was 2000 SSS 2 Chemistry students in Obio/Akpor Local Government Area and the sample size of the study comprises 200 chemistry students (100 male and 100 female) from two public senior secondary schools. The technique for the sample selection was random assignment of intact classes to sample groups.

The instrument used to elicit response for the study was a class test to compare performance of students in motivated group (experimental group) and student's unmotivated group (control group) for the two schools selected. The data collected were analyzed by the use of mean and standard deviation to answer the research questions while the analysis of covariance (ANCOVA) was used to test the hypotheses at 0.05 level of significance.

### Results

**Research Question 1:** What are the achievement mean scores of the motivated and the unmotivated students in Chemistry?

**Table 1: Mean and Standard deviation performances scores of motivated and unmotivated students in Chemistry**

| Group        | N  | Pretest   |      | Posttest  |      | Learning Grain |
|--------------|----|-----------|------|-----------|------|----------------|
|              |    | $\bar{x}$ | SD   | $\bar{x}$ | SD   |                |
| Experimental | 50 | 11.82     | 5.30 | 15.64     | 5.53 | 3.82           |
| Control      | 50 | 10.18     | 5.24 | 12.38     | 5.16 | 2.2            |
| Mean Diff    |    |           |      |           |      | 1.62           |

Table 1 show that the mean performance score of motivated students (Experimental group) in the pretest group was 11.82 with associated standard deviation of 5.30. whereas, the

mean score of the posttest group for the motivated students was 15.64 with associated standard deviation of 5.53. The mean learning gain for the experimental group was 3.82. Table 1 indicates that the unmotivated students (control group) in the pretest group had a mean score of 10.18 with associated standard deviation of 5.24, while the posttest group had a mean score of 12.38 with standard deviation of 5.16.

The mean learning gain of the control group was 2.2. This shows that the experimental group (motivated students) had a higher mean than the control group (the unmotivated students) in Chemistry, with a mean difference of 1.62.

**Hypothesis 1:** There is no significant difference between the academic performance of motivated and unmotivated students in Chemistry

**Table 2: Analysis of Covariance (ANCOVA) of the difference between the academic achievement of motivated and unmotivated students in Chemistry**

| Source          | Type III sum of squares | Df  | Mean square | F      | Sig. |
|-----------------|-------------------------|-----|-------------|--------|------|
| Corrected model | 402.753 <sup>a</sup>    | 2   | 201.376     | 7.304  | .001 |
| Intercept       | 2450.745                | 1   | 2450.745    | 88.893 | .000 |
| Pretest         | 137.063                 | 1   | 137.063     | 4.972  | .028 |
| Gender          | 204.104                 | 1   | 204.104     | 7.403  | .008 |
| Error           | 2674.237                | 97  | 27.569      |        | .000 |
| Total           | 22705.000               | 100 |             |        |      |
| Corrected total | 3076.990                | 99  |             |        |      |

a. R. square: 131 (Adjusted R. squared = .113)

The result of Table 2 was used to determine whether there is significant difference between the academic performance of motivated and unmotivated students in Chemistry. The result in Table 2 shows that an F-ratio of 7.403 with associated probability value of .008 was obtained. The probability value .008 was compared with .05 and it was found to be significant as .008 was less than .05 ( $P < .05$ ). The null hypothesis one ( $H_{01}$ ) was therefore rejected and inference drawn that there was significant difference between the academic performance of the motivated and unmotivated students in Chemistry.

**Research Question 2:** What are the mean scores of the male and female motivated students in Chemistry?

**Table 3: Mean and standard deviation of male and female motivated students in Chemistry**

| Group     | N  | Pretest   |      | Posttest  |      | Learning Grain |
|-----------|----|-----------|------|-----------|------|----------------|
|           |    | $\bar{x}$ | SD   | $\bar{x}$ | SD   |                |
| Male      | 25 | 14.64     | 4.43 | 21.24     | 3.28 | 6.6            |
| Female    | 25 | 13.12     | 4.57 | 21.40     | 2.34 | 8.28           |
| Mean Diff |    |           |      |           |      | 1.62           |

Table 3 shows that the mean score of the motivated male students in the pretest group was 14.64 with associated standard deviation of 4.43, whereas the mean score of the male students in the post test group was 21.24 with standard deviation of 3.28. The mean gain of the pretest group and the posttest group of the males was 6.6 in favor of the posttest group. In Table 3, the mean score of the female motivated students in the pretest group was 13.12 with standard deviation of 4.57, while the mean score of the posttest group was 21.40 with standard deviation of 2.34 and the mean gain was 8.28. The mean difference of the males and the females was 1.68 in favour of the female students.

**Hypothesis 2:** Gender does not have significant effect on mean scores of motivated students in Chemistry

**Table 4: Analysis of Covariance (ANCOVA) of the gender means scores difference of motivated students in Chemistry**

| Source          | Type III sum of squares | Df | Mean square | F       | Sig. |
|-----------------|-------------------------|----|-------------|---------|------|
| Corrected model | 3.091 <sup>a</sup>      | 2  | 1.545       | .187    | .830 |
| Intercept       | 1945.334                | 1  | 1945.334    | 255.774 | .000 |
| Pretest         | 2.771                   | 1  | 2.771       | .336    | .565 |
| Group           | .705                    | 1  | .705        | .085    | .771 |
| Error           | 387.789                 | 47 | 8.251       |         |      |
| Total           | 23118.00                | 50 |             |         |      |
| Corrected total | 390.880                 | 49 |             |         |      |

a. R. square: .008 (Adjusted R. squared = .034)

Table 4 was used to determine whether gender have significant effect on mean scores of motivated students in Chemistry. The result in Table 4 shows that an F-ratio of .085 with associated probability value of .771 was obtained. The probability value of .771 was compared with .05 and it was found not to be significant as .771 was greater than .05 ( $P > .05$ ). Hence, the null hypothesis two ( $H_{O2}$ ) was therefore accepted and inference drawn that, gender does not have significant effect on mean scores of motivated students in Chemistry.

## Discussion

The study sought to investigate students' motivation and academic performance in chemistry in senior secondary schools.

The first purpose of the study was to determine the effect of motivation on students' academic performance in chemistry. What are the performance mean scores of motivated and unmotivated students in chemistry in senior secondary school Chemistry in Obio/Akpor Local Government Area? The study was tested with null hypothesis which states there is no significance difference between the academic performance of motivated and unmotivated students in chemistry.

Analysis of data on table 1 shows that the mean performance score of motivated students (experimental group) in the pretest group was 11.82 with associated standard deviation of 5.30. Whereas, the mean score of the posttest group for the motivated students was 15.64 with associated standard deviation of 5.53. The mean learning gain for the experimental group was 3.82. Also; the table indicates that, the unmotivated students (control group) in the pretest group had a mean score of 10.18 with associated standard deviation of 5.24, while the posttest group had a mean score of 12.38 with standard deviation of 5.16. The mean learning gain for the control group was 2.2. There is a mean difference of 1.62 which shows that, the experimental group (motivated) had a higher mean than the control group (unmotivated).

The result of table 2 was used to determine there is significant difference between the academic performance of motivated and unmotivated students in chemistry. The result shows that an F-ratio 7.403 with associated probability value of .008 was obtained. The probability value .008 was compared with .05 and it was found to be significant as .008 was less than .05 ( $P < .05$ ). The null hypothesis one ( $H_{O1}$ ) was therefore rejected and inference drawn that, there

was significant difference between the academic performance of the motivated and unmotivated students in Chemistry. Result shows that chemistry students who were motivated with computer instruction performed better than those unmotivated using lecture method. This agrees with the finding of Ahiatrogah, Madjoub and Bervell, (2013) who carried out a study on effects of Computer Aided Instruction (CAI) on the achievement of students revealed that the CAI group performed better than the convention method of instruction (CMI) group.

The findings of this study agree with the findings of (Wagbara & Pepple, 2021) as they responded that students' motivation has significant effect on achievement mean score of students in Basic Science.

The result of this study confirmed that students' motivation have significant effect on academic achievement of students in Chemistry.

The second purpose of the study was to determine gender effect of motivation on students' academic performance in chemistry. The study was tested with a null hypothesis which states that gender does not have significant effect on mean scores of motivated students in chemistry. Table 3 shows that, the mean score of the motivated male students in the pretest group was 14.64 with associated standard deviation of 4.43, whereas the mean score of the male students in the post-test group was 21.24 with standard deviation of 3.28.

The mean gain of the pretest group and the posttest group of the males was 6.6 in favour of the posttest group. In table 3, the mean score of the female motivated students in the pretest group was 13.12 with standard deviation of 4.57, while the mean score of the posttest group was 21.40 with standard deviation of 2.34 and the men gain was 8.28. The mean difference of the male and female students was 1.68 in favour of the female students. The result in table 4 shows that an F-ratio of .085 with associated probability value of .771 was obtained. The probability value of .771 was compared with .05 and it was found not to be as significant as .771 was greater than .05 ( $P > .05$ ).

Analysis of data shows that female students performed better than the male students as the result in table 4 shows that the null hypothesis two was accepted and inference drawn that, gender does not have significant effect on mean scores of motivated students in Chemistry. This finding agree with the finding of (Nbina, 2015; Loofa, 2018), who found no significant difference in the achievement of motivated students due to genders.

## **Conclusion**

Given that the aim of the study is motivation effect on students' academic achievement in chemistry in senior secondary schools; it is obvious that motivation has effect on students' academic achievement. It also affects students' attitude in the learning of the subject.

The basis for the advocacy of students' motivation therefore centers on how best the teacher can use classroom instructions that are innovative, activity-based and student-centered. The study indicates that the students motivated were more engaged with interesting activities that could uplift their achievement in the chemistry. This implies that the effective use of motivation by chemistry teachers can improve students' academic achievement in chemistry.

## **Recommendations**

Based on the finding of this study, the following recommendations were made:

- Chemistry teachers need to use instructions that are innovative, activity-based and student-centered in order to engage students for a better academic upliftment.

- Government needs to equip schools with modern facilities and technologies like the computer and internet as well as electricity to run the equipment.
- There is need for teachers to understand students' feelings and attitude since motivation could be intrinsic and extrinsic.

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