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Research Article

Self-Esteem as a Correlate of Students' Achievement in Chemistry in Anambra State, Nigeria

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ABSTRACT

This study looked into the connection between the chemistry achievement of secondary school students in Anambra State, Nigeria, and their self-esteem. Gender's moderating effect on the correlation between these two factors was also identified. For the study, a correlation design was employed. Using purposive and simple random sampling techniques, 210 secondary school II Chemistry students were selected as the sample size. The instruments used were Chemistry Self-Esteem Scale (CSES) and Chemistry Achievement Test (CAT). The reliability indices of 0.88 and 0.82 were obtained for CSES and CAT respectively. For data analysis, ANOVA regression, Pearson correlation, and coefficient of determination were applied. The findings of the study revealed a moderate positive relationship between self-esteem and students' achievement in Chemistry which was significant. Furthermore, there was a noteworthy impact of gender on the correlation between students' achievement in Chemistry and their self-esteem. Thus, it was suggested, among other things, that parents and Chemistry teachers keep an eye on and support male and female students in developing higher self-esteem. Also, there should be workshops and seminars organized by the educational stakeholders on how to improve Chemistry students' self-esteem in order to enhance their achievement in the subject.

KEYWORDS: Self-esteem, Chemistry, Gender and Achievement

1. INTRODUCTION

The success of every student is dependent on the subjective judgment of their self-worth and value in different school activities. Chemistry students who develop this personal value on time go a long way towards acquiring the needed knowledge, attitude and skills and invariably enhancing their achievement. The study of matter, its characteristics, applications, and reactions are the focus of chemistry. Chemistry through its branches helps in the provision of man power in different disciplines like medicine, education, agriculture, pharmacy, astronomy, among others. Therefore, the concept of chemistry is important in every profession and in our everyday lives as every material is made up of matter. For these reasons, chemistry helps man to provide the necessary knowledge and skills in making better decisions towards human development. In Nigeria, therefore, a solid secondary school-based chemistry education is needed for national development. However, research conducted in Nigeria has revealed that students' achievement in chemistry remains poor. Njoku and Ezinwa (2014) [13] and Ezeudu *et al.*, (2019) [6], for example, acknowledged the overall low achievement of students in chemistry. Additionally, students' achievement in the West Africa Examination Council Chief Examiner reports from 2017 to 2021 has been inconsistent,

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indicating the pressing need for students to improve in this area. In identifying the reasons for this problem, Onyi and Nwafor (2022) [15] stated that teaching methods affect students' achievement in chemistry. Moreover, among the factors influencing students' achievement in chemistry according to Sibomana *et al.,* (2021) [21] include; class size, socioeconomic status, school factors, leadership styles, chemistry content, teachers and students' factors and innovative teaching approaches. Beharu (2018) [3] confirmed that some psychological variables such as self-efficacy, motivation, test anxiety among others can affect students' academic achievement. Self-efficacy, emotional intelligence, motivation, and self-esteem are a few of the psychological constructs that González *et al.,* (2017) [7] claim is crucial for academic achievement. Therefore, students' self-esteem could influence chemistry students' achievement.

Self-esteem is the overall personal worth or value of a person. Self-esteem, in the words of Von-Soest *et al.,* (2018) [23], is a measurement of an individual's value, appreciation, approval, prize, or likeness of themselves. It reflects the person's emotional state and personal belief and involves individual decision with respect to themselves. Operationally, self-esteem is the subjective evaluation of self-worth or value by an individual which can be influenced by their thoughts or environmental factors. It helps students to face the challenges of life, achieve academic success and happiness. Self-esteem is made up of two groups namely high self-esteem and low self-esteem. Park and Park (2015) [17] posited that high self-esteem students are open to criticism, creative, productive, admit faults, at ease with compliments and receiving them, and exhibit harmony either in words, deeds, appearance, speech, and/or movement. On the other hand, low self-esteem is linked to violence, school dropout rates, teenage pregnancies, suicide, and subpar academic achievement Dev & Ququieh *et al.*, (2016) [5]. Students who have high self-esteem don't hesitate to express their curiosity or to share their thoughts, ideas, or possibilities. They can also find humour in their life and feel at ease using social or student assertiveness Crinchton *et al.,* (2017) [4]. These traits help high self-esteem students to attain more academic achievement than their low self-esteem counterparts which show unworthiness which could lead to depression and poor achievement. This is in line with Park and Park (2015) [17] which emphasized that boosting self-esteem through brief lessons in the classroom improves self-esteem as well as lowering problem behaviors and fostering relationships among peers while enhancing academic achievement.

Empirical studies on the correlation between students' self-esteem and achievement has shown a lot of reports. Narafshan and Noori (2018) [12] found out that students' self-esteem and achievement are positively and significantly correlated. Similarly, self-esteem is regarded as one of the most significant variables that is associated to high motivation toward good academic achievement, and Keltikangas-järvinen (2020) [10] said that it plays a crucial part in students' desire and ability for academic success. Accordingly, studies by Akram and Suneel (2018) [1] and Orth *et al.,* (2018) [16] found a strong link between students' academic success and their sense of self-esteem. On the other hand, research by Marsh and O'Mara (2008) [11] indicated a weak positive association between academic achievements and self-esteem, while a study by Wibowo (2016) [24] identified a strong but small correlation between achievement and self-esteem.

From the foregoing, it is clear that a lot of research has been done on the relationship between achievement and self-esteem; yet, there aren't many studies of this kind conducted in Nigeria, particularly among chemistry students in Anambra State. The current investigation was required due to this dearth of literature. Moreover, the moderating influence of gender in the correlation will also be determined. This is because the issue of gender and chemistry students' achievement has been inconclusive because of contradictory findings. Almasri *et al.,* (2021) [2] claim that school administrators gender stereotype science courses in favor of the male which affect the girls' show of negative attitude towards science. Male students outperform female students, according to Hands and Greenlee (2017) [8], but Shahzad *et al.,* (2022) [20] favor female students. Furthermore, according to Odukwe and Nwafor (2020) [14] and Ezeudu *et al.,* (2019) [6], gender has no appreciable impact on students' achievement in chemistry. Rahmani (2011) [18] also found a statistically significant difference in the self-esteem and achievement goals orientation ratings between male and female students. According to Subon *et al.,* (2020) [22], there is no discernible difference in the self-esteem of male and female while Illoakasia (2021) [9] proposed that there exists a moderate positive correlation and a high positive correlation, respectively, between self-esteem and academic achievement among male and female college students. The current study established the moderating influence of gender on the relationship between students' achievement in Chemistry and their self-esteem, based on the aforementioned premises.

The study's goal was to ascertain whether students' achievement in Chemistry in secondary schools in Anambra State, Nigeria, and their self-esteem was correlated. Specifically, the study sought to find out: the relationship between self-esteem and secondary school students' achievement in Chemistry; the relationship between self-esteem and achievement of male and female students in Chemistry?

The study was guided by the following research questions. (a) What is the relationship between self-esteem and secondary school students' achievement in Chemistry? (b) What is the relationship between self-esteem and achievement of male and female students in Chemistry? Furthermore, two null hypotheses were developed and evaluated at significance levels of 0.05. (a) There is a significant relationship between self-esteem and secondary school students' achievement in Chemistry. (a) The moderating influence of gender on the relationship between self-esteem and secondary school students` achievement in Chemistry is not significant.

2. MATERIALS AND METHODS

A correlational survey design was employed as the study's research methodology. All 1,052 senior secondary Chemistry students from the twenty-one (21) secondary schools in the Aguata Local Government Area of Anambra State, Nigeria, made up the study's population. Two hundred and ten (210) SSII Chemistry students, or 20% of the overall population, made up the

study's sample size. Fifteen coeducational schools in the Local Government Area were chosen through purposeful sampling, and the sample size for the study was determined by simple random sampling via balloting.

The Chemistry Achievement Test (CAT) and Chemistry Self-Esteem Scale (CSES) served as the study's tools. The researchers devised 25 objective questions for the Chemistry Achievement Test, while the 10-item, four-point Likert scale CSES was derived from the Rosenberg Self-Esteem Scale (RSES) created by Rosenberg in 1965[19]. The instruments were validated by three experts: one from the Department of Science Education (Measurement & Evaluation Unit) at University of Nigeria, Nsukka, and two from the Department of Science Education (Chemistry Unit) at Nnamdi Azikiwe University, Awka, Anambra State. The reliability of CSES and CAT were assessed using the Kuder Richardson 20 (K-R-20) and Cronbach Alpha formula, respectively. CSES and CAT have reliability values of 0.88 and 0.82, respectively. The researchers handed the instruments to the students, who promptly compiled the data.

To respond to the research questions, Pearson Product Moment Correlation, coefficients of determination (r2) and (r) were employed. According to this interpretation, a correlation value of r = 0.30 or less indicates a low relationship, 0.31 to 0.80 indicates a moderate link, and 0.81 and higher indicates a high relationship. At the 0.05 level of significance, Hayes Process was utilized to test hypothesis 2, while simple linear regression (Regression ANOVA) was utilized to test hypothesis 1.

3. RESULTS

The following results were shown in accordance with the research questions and hypotheses that served as the study's guide

Table 1: Regression analysis of the relationship between self-esteem and secondary school students' achievement in Chemistry

Model	r	r Square	P	Decision
1	.437	.191	.000	Sig. (Positive moderate relationship)

The correlation coefficient between students' achievement in Chemistry at secondary schools and their self-esteem was found to be.437, as indicated by results in Table 1. This suggests that the achievement of secondary school students in Chemistry and self-esteem have a moderately positive association. The table's data additionally demonstrated that the correlation coefficient of.437 was correlated with a coefficient of determination (r^2) of.191. The coefficient of determination (r^2) shows that students' self-esteem accounts for 19.1% of the variation in secondary school students' Chemistry achievement. Moreover, as the probability value of.000 is smaller than the significance level of 0.05, the null hypothesis was rejected. Thus, the achievement of secondary school students in Chemistry and self-esteem had a strong link (P<0.05).

Table 2: Regression analysis of the relationship between self-esteem and achievement of male and female students in Chemistry

Model	Gender	r	r Square
1	Male	.510	.260
2	Female	.400	.160

Table 2 presents the results of a moderate association between the self-esteem and achievement of male and female students in Chemistry, with correlation coefficients of.510 and.400, respectively. With a coefficient of determination (r2) of.260 and.160, it can be seen that self-esteem accounts for 26.0% and 16.0% of the variations in chemistry achievement between male and female students, respectively.

Table 3: Hayes process analysis of the moderating influence of gender on the relationship between self-esteem and secondary school students` achievement in Chemistry

Model Summary	r	r^2	MSE	F	df1	df2	P
1	.4614	.2129	38.9356	18.5756	3.0000	206.0000	.0000

Table 3 indicates that there is a substantial moderating influence of gender on the link between the achievement of secondary school students in Chemistry and their self-esteem (P =.0000). Thus, the null hypothesis, which contends that gender has no significant moderating influence on the association between achievement in chemistry and self-esteem in secondary school students, was rejected. This is as a result of the p-value of.0000 being less significant than the 0.05 level. This suggests that gender has a major impact on the association between students' achievement in Chemistry in secondary schools and self-esteem.

4. DISCUSSION

Chemistry achievement in secondary schools is positively correlated with self-esteem, according to the study's findings. The coefficient of determination showed that students' self-esteem accounts for 19.1% of the difference in secondary school students' achievement in Chemistry. Moreover, a significant correlation (P<0.05) was found between the achievement of secondary school students in Chemistry and their self-esteem, leading to the rejection of the null hypothesis. This means that an increase in students' self-esteem will enhance their Chemistry achievement. The result above as observed by the researchers is due to the fact that most of the students were curious and assertive in the chemistry learning and hence, exhibit high self-esteem which can have an impact on how well they do in the subject. These findings are in line with Akram and Suneel (2018) [1] and Narafshan and Noori (2018) [12] who found out that students' self-esteem and achievement are positively and significantly correlated. In a similar vein, the results support the findings of Orth *et al.,* (2018) [16], who found a significant association between students' achievement and self-esteem. Conversely, the finding is against that of Marsh and O'Mara (2008) [11] and Wibowo (2016) [24] which showed a weak positive but significant association between achievement and self-esteem.

According to the study's findings, male and female secondary school students' achievement in Chemistry and their self-esteem were moderately correlated. According to the coefficient of determination, the self-esteem of male and female secondary school students can account for 26.0% and 16.0% of the variations in their achievement in Chemistry, respectively. Furthermore,

there was a significant correlation between the gender of a student and their achievement in Chemistry at the secondary school level in relation to self-esteem. This indicates a gender gap in the relationship between students' achievement in Chemistry and their self-esteem in the Aguata Local Government Area of Anambra State, Nigeria. This could be because of the observed gender favoritism in Chemistry classes, as male students have more opportunity to interact with their teachers, hence, the personal worth or value of the female students were lowered compared to their male counterparts. Rahmani's (2011)[18] assertion that there is a statistically significant difference between male and female students' self-esteem levels lends credence to these findings. Furthermore, the results concur with Illoakasia's (2021) [9] findings regarding a moderately positive relationship between male and female students' self-esteem, but they differ with it regarding the strong positive relationship between students' achievement and self-esteem, as the current study found a moderately positive relationship between the two variables. However, the results contradict those of Subon *et al.*, (2020) [22], who found no discernible differences in academic achievement or self-esteem between males and females.

5. CONCLUSION

The researchers came to the conclusion that gender and self-esteem are major factors in chemistry students' academic achievement since higher self-esteem is a strong and favorable predictor of academic achievement in the subject. In light of this, it was concluded that chemistry teachers should design strategies to balance the gender differences in chemistry learning processes. Based on the study's findings, the Post Primary Schools Service Commission (PPSSC) and school principals were advised to hold conferences, seminars, and workshops on boosting students' self-esteem in Chemistry in order to raise their academic achievement. Government should provide counselors in every school to help students with low self-esteem. Students should boost their self-esteem by equipping themselves with the needed knowledge and skills. Parents and chemistry instructors should keep a tab on students' self-esteem development and support it. Moreover, Chemistry teachers should use strategies that improve students' self-esteem and their achievement. This can be done through by participative (students-centered) learning.

6. CONFLICTS OF INTEREST

There is no conflict of interest disclosed by the authors.

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