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LOCUS OF CONTROL AS PREDICTOR OF SECONDARY SCHOOL STUDENTS' INTEREST IN CHEMISTRY IN ANAMBRA STATE, NIGERIA

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Abstract

The study investigated on locus of control LoC as predictor of secondary school students' interest in Chemistry in Anambra State, Nigeria. Two research questions guided the study while two hypotheses were tested at .05 alpha level. The moderated mediation design was adopted. The population of the study comprised 16,590 senior secondary two students offering Chemistry in all the public secondary schools in Anambra State. The sample size of this study consists of 964 senior secondary school two Chemistry students drawn from 113 co-education secondary schools out of the 263 public secondary schools in Anambra State. The sample was drawn using multi-stage sampling procedure. Academic Locus Of Control Scale (ALOCS) adapted from Trice academic locus of control scale (1985) and Chemistry Interest scale (CIS) adapted from Ojo (2015) were the instruments used for data collection. The instruments were validated by three experts. The reliability of the instruments were established using Cronbach alpha method. The reliability coefficients of ALOCS and CIS were found to be 0.79 and 0.81. Coefficient r and R^2 were used to answer research question while linear regression were used to test the hypotheses. The findings from the results revealed that LoC significantly predicted interest in Chemistry ($r = .347$, $R^2 = .120$, $p < .05$) and LoC significantly predicted interest in Chemistry when moderated by gender ($r = .3537$, $R^2 = .1251$, $p < .05$). It was concluded that LoC modestly boosts secondary students' Chemistry interest; gender moderates this effect. It was recommended that Chemistry teachers should foster LoC.

Keywords: Science, Chemistry, Locus of Control and Interest

Introduction

Science pervades every aspect of modern life. The presence of machines, automobiles, mills, and factories shapes our daily routine. The foods we eat, the clothing we wear, and the books and papers we read are all connected to scientific applications. Recognizing science's importance, the Nigerian government has consistently pursued initiatives to provide qualitative and quantitative science education for its citizens (Obikezie, Ezeliora & Okafor, 2023. Furthermore, given ongoing modernization, the global workforce requires individuals who possess the appropriate attitudes and skills in science and technology, with Chemistry serving as a core subject in this domain

Chemistry is a branch of science that studies the properties, composition, and structures of matter, as well as the changes it undergoes and how these changes affect human welfare and society. The discipline has made tremendous contributions to the world, helping us understand the human body, our environment, and the benefits and hazards of the natural world. It increasingly informs solutions in health, agriculture, food, shelter, clothing, and education (Abumchukwu & Okigbo, 2023). Virtually every aspect of daily life is touched by Chemistry.

Chemistry, despite its central role, exhibits inconsistent student achievement. West African Examination Council (WAEC) data (2015–2024) show pass-rate fluctuations from 54.6% to 62.7%, indicating shallow understanding or negative attitudes toward science. Chief Examiners repeatedly identify weaknesses in: interpreting questions, scientific communication, and the use of precise chemical language (including misused names, incorrect gas-law units, and erroneous formulas). Additional challenges include following instructions, distinguishing molar mass from relative atomic mass, and applying correct units and calculations (Abumchukwu & Okigbo, 2023). But some scholars argue that national tech advancement requires at least 70% Chemistry

achievement (Obikezie et al., 2023). While evidence still show weaknesses in Chemistry subject. Studies shown that factors responses in Chemistry weaknesses among secondary school students in developing countries include locus of control, self-efficacy, instructional quality, language, resources, and mental health; this study focused on locus of control.

Locus of control is the degree to which individuals believe they can influence events and outcomes through their own actions versus external forces like luck, fate, or powerful others. It is how people explain the causes of events in their lives. There are two types of locus of control namely internally and externally locus of control. Internal locus of control belief that outcomes result from one's own actions and abilities while external locus of control belief that outcomes are due to luck, fate, or powerful others (Schunk and DiBenedetto, 2020). These types of locus of control refers to how individuals perceive the events that happen to them. They relates to how people attribute their successes or failures to internal or external factors. According to Rotter's (1998) theory, individuals with an internal locus of control believe that they are responsible for their own success or failure, attributing their academic achievement to personal effort, persistence, and strategies. In contrast, individuals with an external locus of control attribute their success or failure to external factors such as luck, fate, or the actions of others. Research has shown that students with an internal locus of control tend to perform better academically. This is because internally-oriented students are more likely to take responsibility for their learning, set realistic goals, and engage in behaviors that enhance their academic performance (Schunk and DiBenedetto, 2020).

Additionally, locus of control is closely tied to how individuals explain their achievements and losses. It influences individual behavior, with some people showing a low tolerance for change and others easily accepting it. Students' learning abilities, how they process, retain and recall

information, significantly affect their academic performance (Abid, Shah, and Ahmed, 2016). Within psychology, according to Tas, and Iskender (2018), locus of control is considered an important aspect of personality, influencing individuals' responses to events. Szabó-Morvai and Kiss (2023) found that there is a high relationship between students locus of control and there academic interest in education economics. While Aidoo and Mensah (2024) reported a moderate correlation between students locus of control and there interest in Ghana with no significant difference in the correlation.

Interest is a curiosity driven engagement that motivates attention and exploration toward a topic, sustained by relevance, curiosity, and perceived value, often leading to deeper learning and persistence. Interest is a feeling of concentration in order to enjoy some activity (Bolkan, Goodboy and Myers, 2017). Interest can be observed from an individual's likes and dislike as well as his/her actions and activities. Student's interest is seen as the expression of enthusiasm and commitment in the classroom when teaching is going on. As a matter of choice, engagement in activities within learner's environment outside the classroom enhances interest. Interest shown by science students during learning a subject is evident in their academic achievement (Bricteux, Navarro, Ceja, and Fuerst, 2017). These are seen primarily in students' curiosity to learn any science subject including Chemistry concepts, asking questions, listening to the teacher and properly doing homework/ assignment. No wonder Burnette, Hoyt, Russel, Lawson, Dweck, and Finkel (2020) buttressed that when students are genuinely interested in a subject, they are more likely to engage deeply and achieve better results. This means that interest fuels motivation and encourages students to pursue activities that bring them recognition and personal fulfillment. Studies shown that interest does not only promotes effective learning but also correlates with higher academic achievement in

Chemistry and Psychology (Phan and Ngu, 2018; Ashley, Knekta, and Corwin, 2019; Ezeh, Okoye, Etodike and Udeze, 2018).

More so, Merkine, Zekarias and Woldeyesus (2019) revealed a moderate relationship between locust of control and academic interest. Also the authors observed a significant difference in academic interest in students of different age, significant difference in interest of students from different gender groups. While Shaini, Rucha and Pradeep (2023) observed a significant correlation between locus of control and interest of students. Godpower-Echie and Ihenko (2017) noted that gender has a significant influence on the interest and Demalata, Rhea Mae, Oreiro, Mariano, Estrella, Annamarie, and Valde (2024) revealed a higher number of female respondents, compared to boys, exhibiting stronger interest in science subjects and higher participation in classes. Adedeji, Adeyinka, and Olufemi, (2009) indicated that locus of control, interest in schooling and self-efficacy jointly and relatively contribute significantly to the prediction of academic achievement, interest and gender of the Junior Secondary School Students.

Statement of the Problem

Despite Chemistry's vital role, WAEC data (2015–2024) show inconsistent student achievement, with pass rates fluctuating from 54.6% to 62.7%. Studies indicate Chemistry achievement largely depends on student interest. Researchers also identify factors such as locus of control, self-efficacy, instructional quality, language, interest, resources, and mental health as influential. In Anambra State, Nigeria, gaps persist in understanding how locus of control predicts secondary students' interest in Chemistry, necessitating a study that clarifies this relationship and informs targeted interventions to enhance engagement and performance. Also the issues of gender is inconclusive and most of the studies reviewed were done outside Chemistry. On this premise

the study examined locus of control as predictor of secondary school students' interest in Chemistry in Anambra State, Nigeria.

Purpose of the Study

The purpose of the study was to determine the locus of control as predictor of secondary school students' interest in Chemistry in Anambra State, Nigeria. Specifically, the study sought to determine the;

1. Predictive value of locus of control on secondary school students' interest in Chemistry.
2. Moderation influence of gender on secondary school students' locus of control in predicting their interest in Chemistry.

Research Questions

The following research questions guided the study:

1. What is the predictive value of locus of control on secondary school students' interest in Chemistry?
2. What is the moderation influence of gender on secondary school students' locus of control in predicting their interest in Chemistry?

Hypotheses

The following null hypotheses formulated to guide the study were tested at 0.05 level of significance:

1. The predictive value of locus of control on secondary school students' interest in Chemistry is not significant.

2. Moderation influence of gender on secondary school students' locus of control in predicting their interest in Chemistry is not significant.

Method

This study adopted moderated mediation design. The area of study was Anambra State, Nigria. The population of SS2 Chemistry students is 16,590 with males totaling 7542 and the females totaling 9048. The sample size of the study consisted of 964 SS2 Chemistry students drawn from 113 co-education secondary school out of the 263 public secondary schools in Anambra State. The sample was drawn using multi-stage sampling procedure to ensure representative and unbiased participation across Anambra State, Nigeria. Initially, simple random sampling selected three education zones from six: Aguata, Awka, and Onitsha. In practice, each zone's name was written on folded papers, placed in a bag, and drawn sequentially to determine the zones, with steps repeated if a zone appeared more than once, guaranteeing equal selection chances for all zones.

In the second stage, purposive sampling identified one hundred twenty-six co-educational secondary schools within the three chosen zones. This approach aligns with Nworgu's (2015) assertion that purposive sampling targets units possessing characteristics pertinent to the study's aims, specifically mixed-gender schools in this context.

The final stage involved proportionate random sampling to select schools from the three zones and their local government areas. Because the numbers of local governments and schools varied across zones, sampling fractions were calculated by dividing the intended sample size by the population size, yielding proportional allocations. Consequently, the number of sampled schools per local government reflected each area's share of the mixed-gender school population, ensuring accurate representation across the study region.

Instrument

Academic Locus Of Control Scale (ALOCS) adapted from Trice academic locus of control scale (1985) and Chemistry Interest scale (CIS) adapted from Ojo (2015) were the instruments used for data collection.

ALOCS and CIS were validated by three experts, two from Department of Science Education and one from Department of Educational Foundation all from Nnamdi Azikiwe University, Awka while average termly Chemistry scores from teachers' grade book for 2024/2025 academic session from the sampled schools was not validated because it is a standard instrument. ALOCS and CIS generated 0.79 and 0.81 consistency values after try testing the instruments in another area that is not the place of the study using Cronbach alpha.

Data generated from the study was analysed using r and R^2 to answer research questions. In interpreting the correlation coefficients, the rule posited by Nworgu (2015) about the interpretation was adopted for the interpretation of the study using the range of scores as thus: ±0.80 to ± 1.00 was assigned to high positive or negative predictive value, ±0.31 to ± 0.79 was assigned to moderate positive or negative predictive value, ±0.00 to ± 0.30 was assigned to low positive or negative predictive value. In interpreting the null hypotheses, the decision rule is that when P-value is less than or equal to 0.05 ($P \leq 0.05$) the null hypotheses was rejected. On the other hand, when P-value is greater than the alpha level 0.05 ($P \geq 0.05$), the null hypotheses was not rejected (accepted).

Results

Research Question 1: What is the predictive value of locus of control on secondary school students' interest in Chemistry?

Table 1: Regression analysis of the predictive value of locus of control on secondary school students' interest in Chemistry

Model	R	R2	Adjusted r2	Std. Error of the Estimate	Decision
1	.347a	.120	.120	9.11298	Moderate positive correlation

a. Predictors: (Constant), CALOCS

Table 1 presents a simple regression where locus of control (CALOCS) serves as the predictor for Chemistry interest. The correlation coefficient (R) of .347 indicates a moderate positive relationship between locus of control and interest. The coefficient of determination (R^2) is .120, meaning locus of control explains about 12% of the variance in students' interest in Chemistry. The adjusted R^2 remains .120, suggesting minimal bias for the model with a single predictor. The Standard Error of the Estimate is 9.113, reflecting typical prediction error. Overall, results show a moderate positive predictive value of locus of control on Chemistry interest.

Research Question 2: What is the moderation influence of gender on secondary school students' locus of control in predicting their interest in Chemistry?

Table 2: Hayes process analysis of the moderating influence of gender on secondary school students' locus of control in predicting their interest in Chemistry

Model Summary

r	R2	MSE	F	df1	df2	p
.3537	.1251	82.7820	44.8998	3.0000	942.0000	.0000

Table 2 presents a Hayes PROCESS moderation analysis, examining whether gender changes the strength of the relationship between locus of control and Chemistry interest. The model yields a multiple R of .3537 and R^2 of .1251, indicating that about 12.5% of the variance in Chemistry interest is accounted for by the combined effects of locus of control and gender, plus their interaction. The mean squared error (MSE) is 82.7820, and the overall model is statistically significant ($p < .001$) with $F(3, 942) = 44.90$. These results suggest a meaningful moderating role of gender in this predictive relationship.

Hypothesis 1: The predictive value of locus of control on secondary school students' interest in Chemistry is not significant.

Table 3: ANOVA Regression analysis of the predictive value of locus of control on secondary school students' interest in Chemistry

ANOVAa

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	10735.500	1	10735.500	129.271	.000b
	Residual	78395.778	944	83.046		
	Total	89131.278	945			

a. Dependent Variable: CIS
b. Predictors: (Constant), CALOCS

Table 3 shows an ANOVA for the regression model with locus of control as the sole predictor. The Regression Sum of Squares is 10,735.500, with 1 df, yielding a Mean Square of 10,735.500 and an F value of 129.271. The associated p-value is .000, indicating the result is highly statistically significant. The Residual Sum of Squares is 78,395.778 with 944 df, and the Total is 89,131.278 with 945 df. Because $p < .001$, we reject the null hypothesis and conclude that locus of control significantly predicts Chemistry interest.

Hypothesis 2: Moderation influence of gender on secondary school students' locus of control in predicting their interest in Chemistry is not significant.

Table 2 reveals that the moderating influence of gender on secondary school students' locus of control in predicting their interest in Chemistry is significant ($F = 44.8998$, $P = .0000$). Therefore, the null hypothesis which states that the moderating influence of gender on secondary school students' locus of control in predicting their interest in Chemistry is not significant was rejected. This is based on the fact that the p-value of .0000 is less than the 0.05 level of significance. This implies that there is a significant influence of gender on the predictive value of locus of control on secondary school students' interest in Chemistry.

Discussion of the Results

The discussion of the findings was done under the following subheadings in line with the research questions and hypotheses that guided the study:

- Predictive value of locus of control on secondary school students' interest in Chemistry.
- Moderation influence of gender on secondary school students' locus of control in predicting their interest in Chemistry

Predictive value of locus of control on secondary school students' interest in Chemistry

The findings of the study revealed that the predictive value of locus of control on secondary school students' interest in Chemistry is moderate and positive. It accounted for 12.0% variance in secondary school students' interest in Chemistry. Further analysis showed that the predictive value of locus of control on secondary school students' interest in Chemistry is significant. This implies that locus of control made a significant contribution on secondary school students' interest in Chemistry, and that an increase in secondary school students' locus of control led to a significant increase in their interest in Chemistry. This is in line with Rotter's social learning theory suggests that students with an internal locus of control view their interest and engagement in Chemistry as a product of their own actions. When they control their learning, they are more likely to develop genuine interest, actively explore concepts, and find enjoyment in the process of discovery. This sense of agency fosters a positive attitude towards Chemistry, leading to increased curiosity and motivation to learn. As a result, their internal locus of control positively influences their interest in Chemistry, making them more likely to engage with the subject, participate in class, and seek out opportunities to learn more. This, in turn, can lead to a deeper and more sustained interest in Chemistry, driving their academic pursuits and exploration of the subject. This findings are in

agreement with that of Merkine, Zekarias and Woldeyesus (2019) who revealed moderate relationship between locust of control and academic interest. But not in agreement with Aidoo and Mensah (2024) who observed a high level correlation between students' locust of control and their interest.

More so, the finding aligned with that of Shaini, Rucha and Pradeep (2023) who observed a significant correlation between locus of control and interest of students. By virtue of this finding, this study has joined the group of scholars that observed that the predictive value of locus of control on secondary school students' interest in Chemistry is moderate, positive and significant.

Moderation influence of gender on secondary school students' locus of control in predicting their interest in Chemistry

The findings of the study showed that the moderating influence of gender on secondary school students' locus of control in predicting their interest in Chemistry is moderate and positive. It accounted for 12.51% of the variance in secondary school students' interest in Chemistry. Further analysis showed that the moderating influence of gender on secondary school students' locus of control in predicting their interest in Chemistry is significant. This implies that gender positively and significantly influence the predictive value of secondary school students` locus of control on their interest in Chemistry. This could be due to the use of the lecture methods as noted by empirical reviews and the intricacy of interest which could have influence students interest prior to this study. These findings agree with Godpower-Echie and Ihenko (2017) who showed that gender has a significant influence on the interest. But did not agree with Demalata, Rhea Mae, Oreiro, Mariano, Estrella, Anamarie, and Valde (2024) who revealed a higher number of female respondents, compared to boys, exhibiting stronger interest in science subjects and higher participation in classes.

In addition, the study align with Adedeji, Adeyinka, and Olufemi, (2009) who indicated that locus of control, interest in schooling and self-efficacy jointly and relatively contribute significantly to the prediction of academic achievement, interest and gender of the Junior Secondary School Students. Also with Merkine, Zekarias and Woldeyesus (2019) who observed that there exist a significant difference in academic interest in students of different age, significant difference in interest of students from different gender groups. By the virtue of the finding from the study, the study has joined the group of researchers' that found that the moderating influence of gender on secondary school students' locus of control in predicting their interest in Chemistry is moderate, positive and significant.

Conclusions

The study concludes that locus of control positively, and moderately, predicts secondary students' interest in Chemistry, explaining 12.0% of the variance. This predictive value is statistically significant, confirming a real relationship. Gender modestly moderates this link: the interaction is moderate and positive, accounting for 12.51% of the variance, with significance. Overall, both locus of control and its gendered moderation meaningfully shape interest in Chemistry, though the effects are moderate in magnitude, warranting nuanced educational attention.

Recommendations

• Given the moderate, significant effects, schools should implement programs that strengthen students' sense of control in learning Chemistry such as goal setting, explicit feedback, and opportunities for autonomy in problem-solving.

• Gender-sensitive approaches should be considered which can explore how locus of control interacts with gender without reinforcing stereotypes.

• Professional development for teachers on fostering internal control and growth mindset can be valuable. Future research should test targeted interventions and assess long-term impacts on Chemistry interest.

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