UNIJERPS
Unizik Journal of Educational Research and Policy Studies VOL.18 (1);
July-December, 2024 https://unijerps.org
2023 Impact Factor:* 6.834;** 2022 ***Impact Factor: 5.156; ***2021 Impact Factor: 5.641;***
tor: 5.355. *Indexing and Impact Factor URL: http://sjifactor.com/passport.php?id=21363*

THE PATH ANALYSIS ON INFLUENCE OF STUDENT VARIABLES ON SECONDARY SCHOOL STUDENTS' ACADEMIC ACHIEVEMENT IN BIOLOGY IN ONITSHA EDUCATION ZONE OF ANAMBRA STATE USING

Prof. Osuafor, Abigail M.
Email: osuafor@unizik.edu.ng
&
Okafor, Eugenia Obiageri.
Email: Okaforeugeobyunizik@gmail.com

Corresponding Author: Okafor Ugenia Obiageri.
Phone No 08038296910

ABSTRACT

The purpose of the study was to determine path analysis on influence of student variables on secondary school students' Academic Achievement in Biology. Four research questions guided the study and four hypotheses were tested at 0.05 level of significance. Correlational research design was adopted for the study. The sample comprised of 357 Biology students in Onitsha Education Zone of Anambra State. Five instruments namely Rosenberg Self-Esteem Scale (RSES), Biology Self-Efficacy Scale (BSES), Beck Anxiety Inventory (BAI) Biology Attitude Scale (BAS) and Study Habit Inventory (SHI). The instruments were revalidated for suitability to local use in Nigeria. Cronbach Alpha was used to determine the internal consistency of the instruments which yielded coefficient values of .87, .82, .89, 89 and .88 for RSES, BSES, BAI, BAS and SHI respectively. Annual results of 2022/2023 SS2 Biology students from the sampled schools were used to obtain the academic achievement of the students. Data collected were analyzed using SPSS version 27 and MPLUS version 7 software and findings revealed that all the variables in the hypothesized causal model directly and indirectly affect academic achievement of Biology students. Self-esteem has high, self-efficacy, attitude and study habit have moderate positive influence, while anxiety has weak negative influence on students' academic achievement respectively. The variables interact through different path ways to predict academic achievement of Biology students. The researcher therefore recommended the variables in the study with less anxiety should be encouraged among students in Onitsha Zones, other zones and other states of the nation for best results in Biology.

Keyword: Path analysis, Biology, student variables, academic achievement.

Introduction

Knowledge of biology helps the students to understand the functions of body cells, tissues and organs. It also enable them to study and interact with their environment

for survival. Hence it is expected that students should achieve better in the subject.

Most Report from earlier studies like Kuburat and Adams (2018), Ibrahim, Lawal and Usman (2017), John and Kawu (2015) indicated that the percentage of those who passed Biology at credit level (A1-C6) for the past thirteen years (2002-2014) in Nigeria were below average. Ogbogu (2023) ; Ejelue (2022) from Onitsha Zone and Nwuba (2021) from Awka Zone stated that the achievement of Biology students from Onitsha and Awka education zone of Anambra state from 2015 to 2019 have been quite unsatisfactory. This shows that, students seem not to be achieving up to expectations in the previous years. Chief Examiner's Report from 2016 to 2019 also revealed that students' achievement in Biology was below expectation. Researchers attributed this poor achievement to factors such as inadequate supply of Laboratory equipment and other teaching and learning resources (Auwalu, Mohd and Mohamed (2014); Dina 2014. Murian and Oyadeyi (2014); Okafor (2019) reported that students' internal state of health such as self-esteem, anxiety, negative self-concept and self-efficacy contributed to poor academic achievement by students.

Irrespective of the results shown above, data from WAEC analysis on academic achievement of Biology students in Onitsha education zone from 2018 to 2022 collected from the office of Planning Research and Statistics (PRS) Department Onitsha Education Zone showed non-conformity to this general impression by most researchers that students' achievements in Biology has not been impressive. Biology students' academic achievements in Onitsha Education zone consequently recorded above average achievement and this should be maintained and even upgraded to the highest level.

The information from analysis of WAEC results of students in Onitsha Zone seem to contradicts the general findings from previous researchers in Biology as shown in the table below.

YEAR	NO OF STUDENTS THAT SAT FOR THE EXAM.	NO OF STUDENTS THAT PASSED (A1 –C6)	NO OF STUDENTS THAT FAILED (P -F)	PERCENTAGE (%) OF PASSED (A1-C6)	PERCENTAGE (%) OF FAILURE (P-F)	OVERALL TOTAL IN PERCENTAGE
2018	3,938	3,348	590	85	15	100
2019	3711	3338	373	90	10	100
2020	3947	3596	351	91	09	100
2021	4,379	3927	452	90	10	100
2022	4638	3493	1145	75	25	100

Data Analysis of WAEC Result on Biology from 2018 - 2022 in Onitsha Education Zone. (Source; Planning Research and Statistics (PRS) Department Onitsha).

It showed that percentage of Biology students who passed WAEC in Onitsha Education zone from 2018- 2022 recorded 85%, 90%, 91%, 90% and 75% respectively.

However how or whether these psychological constructs play a role in improving academic achievement especially in Biology is still not certain. Most earlier studies concentrated on the effects of teaching methods, lack of laboratory equipment, large class size, psychological constructs and others on academic achievement. Not much have been done in the area of analyzing how these variables come together to predict achievement, or how they interact with others to predict achievement through path analysis.

The present study is focused on students' variables (self-esteem, self-efficacy, anxiety, attitude and study habit) in predicting achievement in Biology through causal model in path analysis. The study investigated how the variables can directly or indirectly predict achievement in Biology.

Path analysis is a form of multiple regression statistical analysis that is used to evaluate causal models by examining the relationships between a dependent variable and two or more independent variables. By using this method, one can estimate both the magnitude and significance of causal connections between variables. According to Sylvester, Mirriele, Timothy and Rachel (2015) self-esteem has been used in psychology to reflect a person's overall emotional evaluation of his or her own worth. They opined that, it is a judgment of oneself as well as an attitude towards the self. Self-efficacy is another variable of interests, Bandura in Malte, Ronny & Urich (2014) stated that it is a personal confidence in ones capabilities for accomplishing a task. Okafor 2019 stated that self-efficacy is a personal judgment of confident of an individual having the requisite skills and ability to execute an action. Once an action is taken, high efficacious people invest more effort and persist longer than those who are low in self-efficacy; when set back occurs, they recover more quickly and maintain the commitment to their goals.

Attitude is also a variable of interest. According to Kingdom and Etokeren (2020) attitude is a very complex and unique concept which has to do with the cognitive, affective and psychomotor domains of learning. Ebuoh (2011) said that attitudes is mental and natural state of readiness organized through experience, exerting a directive and dynamic influence upon the individuals' response to all objects and situations which is related. Another variable the researcher considered is anxiety. According to Khairuna, Aakiti and Ooi (2018) anxiety is a state of intense apprehension, uncertainty, and fear resulting from the anticipation of a threatening event or situation, often to a degree that normal physical and psychological functioning is disrupted. Study habit is also a variable of interest, it is refers to predispositions which students have developed towards private readings through a period of time (Usman and Olosunde, 2017). Study habits comprises how one is involved in creating time to study and even making it a routine, finding a quiet location, and suitable time to study and think logically, taking break, setting achievable goals, practicing exercises or test willingly by oneself.

Riffat, Ghazala and Anjum (2011) assert that academic achievement refers to particular setting which is defined by examination marks, teachers given grades,

and percentile in academic subjects. There is need to embark on this research to ascertain path analysis on the influence of students' variables (self-esteem, self-efficacy, attitude, anxiety, and study habit) on academic achievement of students in Biology and to find out if the variables contributed to the impressive academic achievement of students in Onitsha education zone.

Statement of the problem

Over the years, there has been general impression from many researchers, examination bodies and Educators that students' achievement in biology has not been impressive and generally below expectation. However, data obtained from WAEC analysis on academic achievement of Biology students in Onitsha education zone in Anambra State from 2018 to 2022 showed contrary view. Biology students' academic achievement in Onitsha Education Zone Anambra State has been consistently being impressive for the past five years. Hence it becomes necessary to have a closer look at this impressive achievement in this area to find out if certain students- related psychological variables (self-esteem, self-efficacy, and anxiety attitude and study habit) are playing a significant role in improving their academic achievement in Biology.

The present study therefore, sought to find out no how the students' variables like students' self-esteem, self-efficacy, anxiety, attitude and study habit predict achievements of biology students directly and indirectly in terms of the directions and estimate of strength of causal path of various variables in the model. How the variables individually and jointly determined academic achievement of Biology students, how the variables influence may interact through different path ways to predict academic achievement in biology and path model that predicted most the academic achievement in Biology.

Purpose of the study

The purpose of this study is to determine the influence of student variables (self-esteem, self-efficacy, attitude, anxiety and study habit) on secondary school students' academic achievement in biology in Onitsha Education Zone of Anambra State using path analysis.

Research Questions:

The following research questions guided the study:

1. What are the direct and indirect effects of the independent variables (self-esteem, self-efficacy attitude, anxiety and study habit) on academic achievements in Biology?
2. What are the directions and estimate of the strength of Causal Path (path coefficient) of the
Various variables) in the model for academic achievement of students in Biology?
3. What are the relative contributions each of the independent variables to the prediction of students' academic achievement in Biology?

Hypotheses

The following hypotheses will be tested at 0.5 level of significance

1. There is no significant direct and indirect effects of the independent variables on academic achievements of students in Biology.
2. There is no significant directions and estimate of the strength of causal path (path coefficient) of the various variables in the model for academic achievement in Biology
3. There are no significant contributions of each of the independent variables to the prediction of students' academic achievement in Biology.

Conceptual Framework

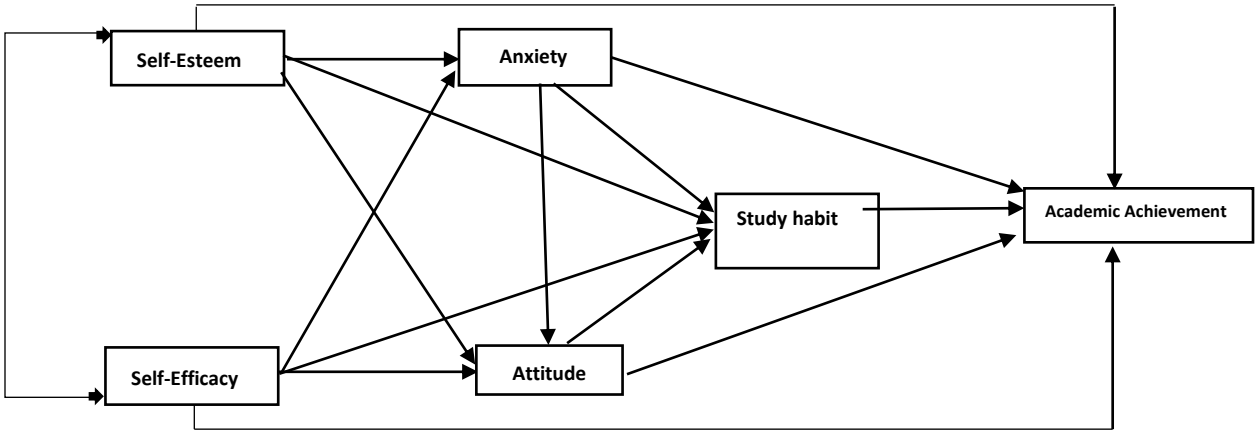


Figure 1: Path causal diagram showing conceptual framework of the study**.**

The causal model showed there are five independent variables (self-esteem and self-efficacy, attitude, anxiety and study habit), and one dependent variable (Achievement). The model also showed that the independent variables (self-esteem and self-efficacy) will directly predict the dependent variable (Academic achievement) also self-efficacy and self-esteem can predict achievement through other variables in the model.

Additionally, the model shows that other independent variables attitude, anxiety as well as self-esteem and self-efficacy will predict study habit. That all the independent variables (self-esteem and self-efficacy, attitude, anxiety, and study habit) will collectively predict dependent variables (academic achievement). Therefore this model represent a path model for the influence of students' related variables and academic achievement in Biology.

Research Method

Research Design

The research design adopted for this study was Correlational Survey. According to Nworgu (2015), a correlational study seeks to establish relationship between two or more variables. The researcher will employ this design because this study seeks

to establish the relationship that exist between students related variables (self-esteem, self-efficacy, anxiety, attitude and study habit) and dependent variables (achievement) using path modeling.

Population of the study

The population of the study consisted of 5087 Senior Secondary two (SS11) Biology students in the 32 public schools in Onitsha Education Zone of Anambra State.

Sample and Sampling Techniques

The sample of the study was made up of 357 senior secondary two (SS11) biology students drawn from the three Local Government Areas in Onitsha Education Zone using multistage sampling procedures.

Instruments for data collection

Five standardized instruments were used for data collection namely: Rosenberg Self- Esteem Scale (RSES) by Rosenberg (1965), Biology Self-efficacy Scale (BSES) Adapted from Schawarzar and Mathias (1979), Beck Anxiety Inventory (BAI) by Beck, Epstein, Brown and Steer (186), Biology Attitude Scale (BAS) by Pavol, Gaye, and Julia (2007) and Study Habit Inventory (SHI) by Jhoselle, Rayo, Lubo, and Cruz (2020). The academic achievement in Biology was obtained from Biology annual result (2022/2023) of the SS2 Biology students from the sampled schools.

The instruments were revalidated to ensure their suitability for local use in Nigeria by four experts, three from Nnamdi Azikiwe University, while one is from Alex Ekwueme Federal University, Ndufu-Alike, Eboyi State.

Cronbach Alpha was used to determine the internal consistency of the instruments which yielded coefficient values of; .87, .82, .89, 89 and .88 for RSES, BSES, BAI, BAS and SHI respectively.

Method of Data Analysis

All data relating to the study were analyzed using (SPSS) version 27 and MPLUS version 7 Software. Data relating to research questions and hypothesis were analyzed using mean, standard deviation, correlation, unstandardized estimate (coefficient) and regression statistics, Research hypotheses were tested using Chi-square statistic, Bootstrapping and Adjusted R- square.

Presentation of Results

Research Question 1. What are the direct and indirect effects of variables on academic achievements in Biology?

The direct and indirect effect of the independent variables (self-esteem and self-efficacy attitude, anxiety and study habit) on academic achievements in Biology are presented in table 1, A t value of standardized estimates < 1.96 indicates no effect

Table 1:*Direct and indirect effects of the independent variables on academic achievements in Biology*

Variables	Unstandardized	Standardized	T
Direct effect on Achievement			
Self-esteem	.641	.347	6.819
Self-efficacy	.399	.413	10.723
Anxiety	-.2.060	-.072	2.446
Attitude	.137	.137	3.567
Study habit	.310	.298	9.779
Indirect effect on Achievement			
Self –esteem through study habit to Achievement.	.073	.064	4.294
Self-efficacy through study habit to Achievement.	.131	.169	13.11
Anxiety through study habit to Achievement	.024	-.001	.667
Attitude through study habit to Achievement	.104	.104	69.330
Self-esteem through attitude to Achievement	.001	.043	.862
Self –efficacy through attitude to Achievement	.083	0.86	4.443
Self-esteem through anxiety to Achievement	.039	-.001	2.434
Self-efficacy through anxiety to Achievement	0.12	-.001	8.721
Indirect effect on Study Habit			
Self-esteem through anxiety to study habit	.001	-.001	.062
Self-efficacy through anxiety to study habit	.001	-.001	1.186
Self-esteem through attitude to study habit	.002	.101	1.322
Self-efficacy through attitude to study habit	.204	.219	13.492
Self-esteem through anxiety to attitude	.450	-.064	3.899

Table 1 shows that self-esteem, self-efficacy, attitude, anxiety and study all have direct effect on students' academic achievement in biology. In term of indirect effect, self –esteem, self-efficacy and attitude have indirect effect through study habit to achievement, while anxiety has no indirect effect on students' academic achievement through study habit. Furthermore, attitude has indirect effect on students' academic achievement in biology through study habit. While self-esteem has no indirect effect on students' study habit through attitude, similarly self-esteem has no indirect effect on students' study habit through anxiety.

Research questions 2. What are the directions and estimate of the strength of causal path (path coefficient) of the various variables (self-esteem, self-efficacy, anxiety, and attitude and study habit) in the model for academic achievement of students in Biology?

Table 2. Directions and estimate of the strength of path coefficient ((standardized estimates) in the causal model

Variables that has effects on Achievement	Path co-efficient	Unstandardized	Direction	Strength
Self-esteem	.347	.641	+	High
Self-efficacy	.413	.399	+	High
Anxiety	-.072	-2.060	-	Weak
Attitude	.137	.137	+	Moderate
Study habit	.298	.310	+	Moderate
Variables that has effect on study habit				
Anxiety	-.003	-.078	-	Weak
Attitude	.349	.336	+	High
Self-esteem	.218	.235	+	Weak
Self-efficacy	.457	.424	+	High
Variable that has effects on Attitude				
Self-esteem	.319	.262	+	High
Self-efficacy	.630	.608	+	High
Anxiety	-.230	-.450	-	Moderate
Variable that has effects on Anxiety				
Self-esteem	-.280	-.135	-	Moderate
Self-efficacy	-.190	-.006	-	Weak

NB - indicates negative direction, + indicates positive direction
Intercepts: Anxiety= .323, Attitude =20.816, Study habit=12.142, Achievement=9.262.
Path co-efficient below .1 is low, .11 to .30 is moderate, .31 to .50 high while .51 and above very high (Cohen, 1988).

Tables 2 shows that self-esteem (.347) has high, and other variables; self-efficacy (.413), attitude, and study habit have moderate positive influence on students' academic achievement respectively. While anxiety (-.072) has weak negative influence on students' academic achievement. This means that increase in anxiety on students can lower their academic achievement. Also attitude (.349) and self-efficacy (.457) have high positive influence on study habit while self-esteem has weak positive influence on study habit. This implies that high or low self-esteem might weakly influence students' study habit. More so anxiety (-.003) has negative weak influence on students study habit of students. This means that high level of anxiety will weakly influence the study habits of students. Furthermore self-esteem and self-efficacy have high positive influence on students, attitude, this implies that positive self-esteem and self-efficacy will enhance positive attitude of students hence increase in academic achievement. Finally, self-esteem (-.280), and self-efficacy (-.190) have moderate and weak negative influence on students' anxiety. In other words, higher self-esteem and self-efficacy should lower or reduce anxiety. See figure 1 for details.

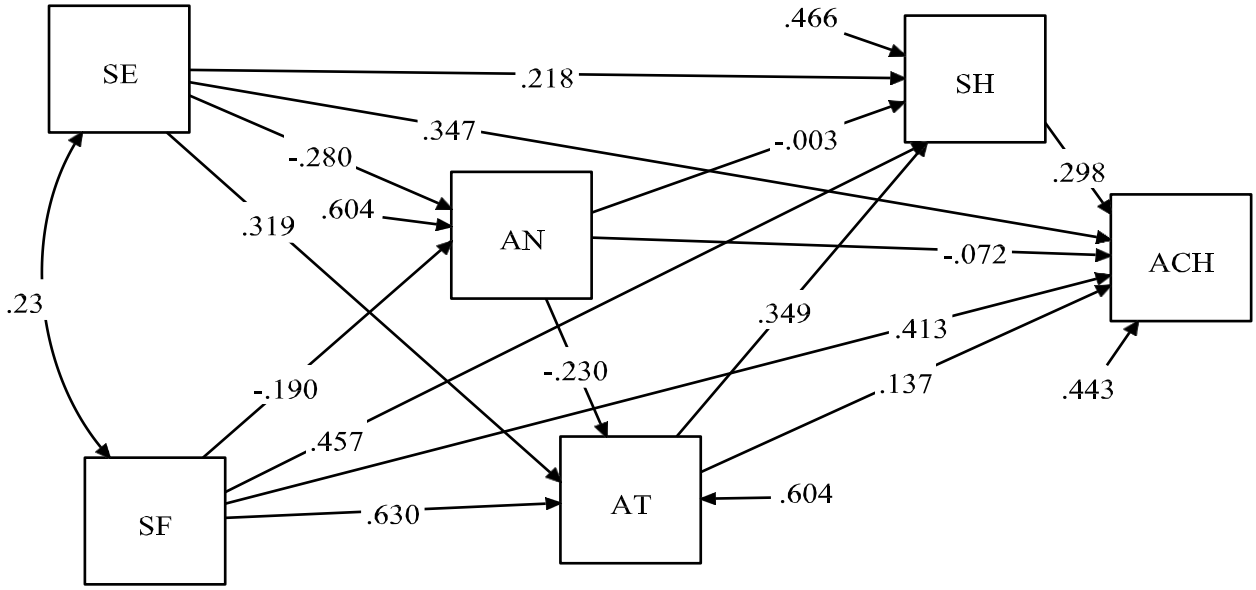


Fig 2 Hypothesized causal Model showing the directions and estimate of the strength of causal path (path coefficient) of the various variables in the model for academic achievement of students in Biology.

Note: SE =Self-Esteem, SF=self-Efficacy, SH= Study Habit, AN= Test Anxiety, AT= Attitude towards Biology, Ach = Academic achievement.

Research question 3. What are the relative and composite contributions of all the independent variables to the prediction of Students' academic achievement in Biology?

Table 3: *Relative contributions of all the independent variables to academic achievement in the hypothesized causal model*

Relative contributions of each Variables to Achievement	R^2	Adjusted R^2	Rank	Remark
Self-esteem	.375	.369(36.9%)	3rd	High
Self-efficacy	.477	.471 (47.1%)	1st	High
Anxiety	.014	.012 (1.2%)	5th	Low
Attitude	.326	.324 (32%)	4th	High
Study habit	.430	.430 (43%)	2nd	High
Composite contributions of all variables to achievement	.557	.551 (55.1%)		Very High
Relative contribution of the other variables to achievement				
Anxiety	.014	.012 (1.2%)	3rd	Moderate
Attitude	.326	.324 (32%)	2nd	High
Study habit	.430	.430 (43%)	1st	Very High

NB-- Adjusted R^2 below .1 is low, .11 to .30 is moderate, .31 to .50 high while .51 and above very high (Cohen, 1988).

The result in table 3 shows that all the variables yielded an adjusted R squared of .551. This implies that all the variables in the hypothesized causal model contributes 55.1% of variance of students' academic achievement in biology. In line with Cohen (1988) guidelines for interpreting the contributions of variables to dependent variables in causal modeling, the variables have meaningful contributions to variance of students' academic achievement in Biology in the hypothesized causal model. In term of relative contributions of each variable to academic achievement in the hypothesized model, self-esteem has high contribution to variance in students' academic achievement in Biology (36.9%), self-efficacy has high contribution to variance of students' academic achievement in Biology (47%), Anxiety has low contribution to variance in students' academic achievement in Biology (1.2%), Attitude has high contribution to variance in students' academic achievement in Biology (32%), while study habit also has high contribution to variance of students' academic achievement in Biology (43%). Table also shows that, self-efficacy contribute most to variance of students' academic achievement in biology in the hypothesized path causal model, followed by study habit, self-esteem, attitude and anxiety.

Hypotheses

Hypothesis 1. There is no significant directions and estimate of the strength of causal path (path coefficient) of the various variables in the model for academic achievement in Biology.

The significant of causal path (path coefficient) of the various variables in the model for academic achievement in Biology was tested using t-test of standardized regression weights with their p-values. A p< .05 indicates that the path is statistically significant and meaningful.

Table 4: *t-test of Path co-efficient (standardized estimates) in the hypothesized causal model*

Variables effects on Achievement	Path co-efficient (standardized estimates)	SE	t-test	p-value
Self-esteem	.347	.030	11.566	.003
Self-efficacy	.413	.042	9.757	.000
Anxiety	-.072	.031	2.365	.018
Attitude	.137	.040	3.420	.001
Study habit	.298	.040	7.376	.000
Variables effect on study habit				
Anxiety	-.003	.031	.093	.926
Attitude	.349	.035	9.882	.000
Self-esteem	.218	.029	7.517	.000
Self-efficacy	.457	0.34	13.604	0.00
Variable effects on Attitude				
Self-esteem	.319	.034	2.562	.004
Self-efficacy	.630	.023	27.126	.000
Anxiety	-.230	0.22	10.455	.002
Variable effects on Anxiety				
Self-esteem	-.280	.040	7.017	.000
Self-efficacy	-.190	.038	5.047	.000

Table 4 shows that self-esteem, self-efficacy, anxiety, attitude and study habit all have significant effects on students' academic achievement in biology (p<.05). More so, self-esteem, self-efficacy and attitude have significant effects on study habit (P<.05) on the other hand anxiety has no significant effects on students' study habit (P>.05). Furthermore self-esteem, self-efficacy and anxiety have significant effects on students' attitude towards Biology (P<.05). Finally, self-esteem and self-efficacy have significant effect on anxiety (p<0.5).

Hypothesis 2 There is no significant direct and indirect effect of the independent (self-esteem and self-efficacy, attitude, anxiety and study habit) on academic achievements of students in Biology

To ascertain if the direct and indirect effect is significant, the bootstrapped bias-corrected confidence intervals and p values of both direct and indirect effect were examined. A bootstrapped bias-corrected confidence interval that does not cross zero, at 95% probability level indicates that the direct or indirect effects is statistically significant and meaningful (Bollen, 1990).

Table 5: *A bootstrapped bias-corrected confidence interval of direct and indirect effect of the independent on academic achievements of students in Biology*

Variables	Standardized estimates	25% Lower	95% Upper
Direct effect on Achievement			
Self-esteem	.347	.032	.097
Self-efficacy	.413	.344	.484
Anxiety	-.072	-.122	-.021
Attitude	.137	.071	.203
Study habit	.298	.233	.366
Indirect effect on Achievement			
Anxiety	-.014	-.015	-.016
Attitude	.104	.073	.135
Study habits	.132	.125	.167

Table 5 shows that a bootstrapped bias-corrected confidence interval of direct effect of self-esteem, self-efficacy, anxiety, attitude and study habit on students' academic achievement did not cross zero, at 95% confidence interval meaning that self-esteem, self-efficacy, anxiety, attitude and study have significant direct effect on students' academic achievement in Biology..

Table 5 also showed that bootstrapped bias-corrected confidence interval of indirect effect of anxiety on students' academic achievement did not cross zero at 95% confidence interval meaning that anxiety has a significant indirect effect on students' academic achievement in Biology. A bootstrapped bias-corrected confidence interval of indirect effect of attitude on students' academic achievement did not cross zero at 95% confidence interval meaning that attitude has significant indirect effect on students' academic achievement in Biology Furthermore, a bootstrapped bias-corrected confidence interval of indirect effect of study habits on students' academic achievement did not included zero, at 95% confidence interval meaning that study habit has significant indirect effect on students' academic achievement in Biology.

Hypothesis 3: There are no significant contributions of the independent variables (self-esteem and self-efficacy, Attitude, anxiety and study habit) to the prediction of students' academic achievement in Biology.

Hypothesis 4 was tested using t- test of Adjusted R^2 of direct and indirect contribution of students' variables to academic achievement in Biology. A $p < .05$ indicates that the contribution is statistically significant and meaningful.

Table 6: *t- test of Adjusted R^2 of direct and indirect contribution of students' variables to academic achievement in biology.*

Relative contributions of each Variables to Achievement	Adjusted R^2	t-test	p-value
Self-esteem	.369	11.56	.003
Self-efficacy	.471	23.17	<.001
Anxiety	.012	2.88	.004
Attitude	.324	16.85	P<.001
Study habit	.430	21.06	P<.001
Composite contribution of all variables to achievement	.551	6.52	P<.001
Composite contribution of all Mediating variables to achievement	.468	7.12	P<.001

The result in table 10 shows that all the variables yielded an adjusted R squared of .551. This implies that all the variables in the hypothesized causal model contributes 55.1% of variance of students' academic achievement in Biology is statistically significant (t=6.52, p<.001), the composite contribution of all mediating variables (anxiety, attitude and study habit) to students' academic achievement in Biology is also statistically significant (t=7.12, p<.001).

In terms of relative significant contributions of each variable to academic achievement in the hypothesized model; Self-esteem, self-efficacy, attitude, anxiety and study habit have significant contribution to variance in students' academic achievement in Biology (p<.05).

Discussion

The findings of the study revealed that self-esteem, self-efficacy, attitude, and study habit have positive effects directly and indirectly to academic achievement in Biology. They also have indirect effects through other variables (Attitude, anxiety and study habit) to Achievement. Again anxiety has negative effect directly to achievement and indirectly through other variable (Study habit) to academic achievement in Biology. This means level of anxiety of students may contribute little or none to their study habit, while decrease in anxiety will help to boost self-esteem and self-efficacy

The findings of the study is in line with Afanan, Malak, Chadah, Artheer, Rahaf, Asiya, and Hamza (2019) that self-esteem can help to boost the academic career and confidence of health science students by lifting their self-esteem directly or indirectly and will help to better their academic achievement. The findings of the study of Mohesen, Zeyad, Abdultrahman, Ehsan, Hussian, Frederick, Andrew and Marcus (2017) on Self-esteem, academic self-efficacy, perceived stress, and preferred learning styles on academic performance shows small but significant correlations between academic achievement and self-esteem and self-efficacy among psychology students in Saudi Arabia. The study corresponded with the present study that self-esteem and self-efficacy have positive academic achievement in biology. The study

of Okafor (2019) also gives credence to present study as it revealed positive significant relationship between self-efficacy, and self-concept and academic achievement in Biology. The findings of Asha and Anju (2020) on study habit, supported the present study that a rise in good study habits score will also raise the academic achievement score among high school pupils.

The study also revealed that all the variables have influence on students' academic achievement in Biology.The findings proved that some variables have more predictive power of influence over others. This finding is in line with the findings of Nweze and Okoli (2020) that some factors have more predicting powers than the others.

The findings revealed that all the variables jointly predicted academic achievement in Biology. The finding is in line with Nweze and Okoli that the ten variables the authors worked on jointly predicted academic achievement in Chemistry.

Conclusion

The study concluded that all the variables; self-esteem, self-efficacy, anxiety, attitude and study habit have significant contributions to academic achievement in Biology**.**

Recommendation

Self-esteem, self-efficacy, positive attitude, good study habit, less anxiety should be encouraged among Biology students in Onitsha zone Anambra State for best achievement. There should be orientation on these psychological variables to the zone and other zones of the state at onset of admission especially in senior Secondary one (SS1) for personal development and better academic achievement in Biology.

REFERENCES

Afanan, H. A., Malak, A. C. B., Artheer, A., Rahaf, A., Asiya, W., and Hanza, M.A. (2019) Does Self-esteem lead to high achievement of the science college's students? A study from the six health science colleges. *Saudi Journal of Biological Sciences,* 27(2). Doi: 10.1016/j.sjbs.2019.11.026. On 05 February, 2023.

Anika, N. (2021, November 25). *Calculating your sample size in 2021.*

Ashley, C. (2019, March, 27). *Understanding Path Analysis*..

Auwalu, R. A., Mohd, E. T. & Muhammad, B.G. (2014). Academic Achievement in Biology with Suggested Solution in Selected Secondary Schools in Kano State, Nigeria. *International Journal pf Education and Research. 2*(11*),* ISSN: 2201 6333 (Print) ISSN: 2201-6740 (Online).

Bandura .A. (1986). A Social Cognitive Theory. *Social foundation of thought and Action* Prentice Hall, Inc, Englewood Cliffs. N.

Bandura A. (2001). Social cognitive theory: An agentic perspective. *Annual Review of Psychology* 52(1), 1-26. Doi:10.1146/annurev.psych.52.1.1, PMID 11148297

Bouih, A., Nadif, O. and Benattabou, O. (2021). Assessing the Effect of General Self-efficacy on Academic Achievement Using Path Analysis: A Preliminary Study. *Journal of English Language Teaching and Applied Linguistics* DOI: 10.32996/jeltal.2021.3.4.3.

Byrne, B. M. (2016). Structural Equation Modelling with AMOS: Basic Concepts, Applications, and Programming (3rd ed.). New York: Routledge.

Byrne, B. M. (1994). *Structural equation modeling with EQS and EQS/Windows*. Thousand Oaks, CA: Sage Publications.

Ibrahim, S., Lawal, T.E & Usman, I.A. (2017). Impact of 5E Teaching Cycle on Academic Performance of pre – Nce Biology Students with varied Abilities in NorthWest Zone, Nigeria. *International Journal of Education Benchmark (IJEB),*ISSN: 2489017, University of Uyo.

Ejelue, I.V (2022). Test anxiety, Academic resilience and study Habit as Predictors of Secondary School students' achievement in Biology in Onitsha Education Zone. Unpublished PhD Dissertation, Department of Science Education, Nnamdi Azikiwe University, Awka,

Jhoselle, T., Francis, R., Reymark lubo, and Mark, A.C. (2020). The Learners' Study Habit and Its Relation on their Academic Performance. International Journal of All Research Writings (IJARW). ISSN (O) - 2582-1008. 2 (6), 1-20.

John, S., & Kawu, W, (2015). Experimental Study of Inquiry Teaching Method and student's Achievement in Biology. *Indo- African journal of Education Research, 3(3),* 01- 04.

Khairunisa, A. B. K, Aakiti, M., & Ooi B.K. (2018, December 02), *Anxiety and Academic Achievement among Undergraduate Students.* Retrieved from https://www.researchgate.net/publication/343760560 on October 10, 2022.

Kingdom- Aaron, Glori, I. & Etokeren, I. S. (2019, July 08), Effect of Attitude on Students' Academic Performance in Biology in Senior Secondary School in Rivers State

Kuburat, O. T. & Adams, O.U. (2018, March 24). Students' Computer Skills Students' Achievement in Secondary School Biology in Ogun State, Nigeria. *International Journal of Computer Application. 179(24)33–34.*

Muraina, K.O & Oyadeyi, B.J. (2014). Academic Efficacy and Self Esteem as Predictor Of Academic Achievement among School Going Adolescent in Itesiwaju LocalGovernment Area of Oyo State, Nigeria. *Journal Of education and practice. 5(22)*, ISSN: 2222-1735 (Paper), ISSN 2222-288X (Online).

Nwanze, A. C. 1 and Okoli, J. N. (2020). Path Analysis of Student-Related Factors Affecting Academic Achievement in Chemistry among College of Education Students in Delta State. *JSTME*

https://journals.unizik.edu.ng/index.php/jstme. 3(2), 1-13.

Nwuba, I.S. (2021). Effect of Experiential Learning Approach on Secondary School Students' Critical Thinking Ability and Academic Achievement in Biology in Awka Education, Zone. Unpublished masters' thesis, Department of Science Education, Nnamdi Azikiwe University, Awka. X+76.

Ogbuogu, E. (2023). Relationship between Secondary School Students' Level of Science Process Skills Acquisition and their Academic Achievement in Biology in Anambra State. Unpublished masters' thesis, Department of Science Education, Nnamdi Azikiwe University, Awka. X+76.

Okafor, E. O. (2019). Secondary School Students' Self-concept and Self Efficacy Beliefs as Correlates of Academic Achievement in Biology. (2012-2019) Unpublished Masters' Thesis, Department of Science Education, Nnamdi Azikiwe University, Awka. X+76.

Pavol, P., Gaye, T. and Julia, C. (2007), Slovakian Students Attitude towards Biology. *Eurasia Journal of Mathematics, Science & Technology Education*. 3(4), 287-29. E- ISSN: 1305-8223.

Rifat, U. N.A., Ghazala, N. & Anjum, N. (2011, August 3). A study of relationship between Achievement Motivation, Self-Concept and Achievement in English and Mathematics at Secondary level *International Education Studies 4*(3) 72.

Rosenberg, M. (2021 November, 06). *Using the Rosenberg Self-Esteem Scale*. Department of *Sociology*..

Schwarzer, R.and Matthias, J. (1979). General Self Efficacy Scale (GSE). *Freie University Berlin Psychology, Germnay.*

Schumacker, R. E. (2015). A Beginner's Guide to Structural Equation Modeling (4th ed.). New York, NY: Routledge.

Sylvester. N., Mirrielle, Y. G., Timothy, A., & Rachel, L. G. (2014).The Impact of Lecturer Student Relationship of Self-Esteem and Academic Performance at Higher Education. *Journal of Social Science Studies*. 2 (1), 264 – 281. Doi:10.5296/jsss.v2i1.6772

Umar, G., Yagana, W. S. B., Hajja, K. A. and Mohammed, W. B. (2015) Gender Difference in Students' Academic Performance in Colleges of Education in Borno State, Nigeria: Implications for Counselling. *Journal of Education and Practice* 6(32) 107-114.

Weiner, B. *(1974). Achievement motivation and attribution theory. What Influences self-Efficacy?* Morristown, N.J. General Learning press.