Perceived Impact of Personality Traits on the Academic Performance of Students in Biology

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Abstract

The study examined the perceived impact of personality traits on the academic performance of biology students in Makurdi, a local government area of Benue State, Nigeria. Three research questions were raised and two hypotheses were also formulated and tested. The research design adopted for this study was a descriptive survey design. The study sample comprises 384 students who were randomly selected from the total population of 9,748 students of the 20 government secondary schools in Makurdi Local Government Area of Benue State, Nigeria. The instruments used for data collection in this study were the Five-Factor Inventory Questionnaire (FFIQ) for personality traits and "The Biology Performance Test (BPT)" for academic performance. The data were analyzed using mean and standard deviation to answer the research questions, while ANOVA statistics and *t*-tests were used to test the hypotheses at a .05 significance level. The findings revealed that there was no significant mean difference in the five personality traits of students and the personality traits of Biology students had no significant relationship with their performance in the subject. Also, there was no significant difference in the mean performance of students in each of the five personality traits based on gender. The findings further revealed no significant difference in students' personality traits according to gender and no significant difference in the performance of students who were offered biology according to gender. This study recommends that Special attention be paid to improving the performance of students in Biology in Makurdi to strike an association between the traits. Also, male and female students should be given equal opportunities in biology since there is no gender difference in their personality traits and academic performance.

Keywords: personality traits, performance in Biology, gender, five-factor model

Introduction

Students' academic performance is a crucial feature of education (Rono, 2013). It is considered the center around which the whole education system revolves. Academic performance can be defined as the extent to which a student has attained his or her academic goal, whether long-term or short-term. It measures student performances across various academic subjects and can be influenced by various factors (of which personality traits are a part and our key focus). According to Narad and Abdullah (2016), academic performance is the knowledge gained, assessed by marks by a teacher, and educational goals set by students and teachers to be achieved over a specific period. They added that these goals are measured by using continuous assessment or examination results. These researchers found that several factors contribute to student academic performance improvement. Ali et al. (2013) found daily study hours, the social and economic status of parents/guardians, and age to affect academic performance significantly.

Similarly, Farooq et al. (2011) and Narad and Addullah (2016) also found the economic status of parents, their academic background, and encouragement to be factors that influence academic performance. Proper guidance from parents and teachers, communication skills, and learning facilities have also been significant determinants of academic performance (Singh et al., 2016). Makurdi Metropolis of Benue State is experiencing problems managing secondary schools, ranging from ineffective leadership styles, poor school-community relations, undisciplined, lack of motivation for teachers and students, etc. This has culminated in poor academic performance by students and the inability of teachers to put in their best (Aneke & Akpusugh, 2022).

While many factors are pivotal to students' academic performance, the personality traits of students could influence their academic performance too. The psychological signs that mount up in students before a test include restlessness, unusual body movements, difficulty in concentrating, insomnia, fatigue, muscle contraction, abdominal pain, and tremors (Achor et al.,

2023; Porto, 2013) and these sometimes have a link with their personality traits. These indicators negatively affect student lives and growth, including academic performance. It is the intrinsic, unique qualities of students that are linked to their academic performance. Prior studies have extensively focused on identifying variables related to academic performance; an essential variable in this context is the students' personality.

Personality is the unique set of characteristic patterns of emotions, behaviors, and thoughts that define an individual. It is the total of all the attributes, qualities, and traits that make up an individual's behavioral and psychological tendencies and differentiate them from others. A person's personality develops through a combination of genetic and environmental influences and is shaped over time by the person's experiences, upbringing, and social interactions. Among various students, each was different from the others because of their underlying personalities. Their abilities to interact with others, process information, respond to various conditions and navigate the world differ. On a broad level, cognitive differences, such as intelligence, measure maximal ability: what a student can do. Personality and motivation, in turn, influence typical behavior: what a student will do.

Personality can be conceptualized using personality traits. These are enduring personal characteristics or distinctive qualities revealed in a particular pattern of behavior in various situations. Personality traits are recurring regularities and trends in a person (Colquitt et al., 2009). This system includes five broad traits that can be remembered with the acronym OCEAN: Openness or openness to experience, Conscientiousness, Extraversion, Agreeableness, and Neuroticism. These five broad traits are also called the "Big Five" Factors, and the model is referred to as the "Five Factor Model," abbreviated as FFM. Costa and McCrae (1992) first suggested the Five Factor Model, which is frequently used to explain the connection between a person's personality and different actions.

Humans are naturally grouped into two genders; male or female, boy or girl, man or woman, and everyone falls under one category except for abnormalities. The role of gender in science learning has continued to be at the center of research (Nnamani & Oyibe, 2016). Gender difference is not a new theme in the academic field, as many studies have been done around it with various findings. Results of studies on gender and its influence on Biology have remained inconclusive since either male or female students possess unique personality traits in a given society. There is a need to examine further the role of gender in the academic performance of Biology students.

Statement of the Problem

According to the report from chief examination officers in Nigeria, West Africa Examination Council (WAEC) (Abakpa et al., 2016; Chukwu & Arokoyu, 2019; Lambert & Etim, 2022), the performance of Biology students in 2013, 2014, 2015, 2016, 2017, 2018, 2019,2020 and 2021 has been very poor. These poor academic performances are often unintentional by students, but after many academic failures without a seemingly working remedy, students will likely accept it as their lot. Many students who perform poorly in their studies may become discouraged, lose interest in learning, and eventually drop out of school.

In a bid to overcome the unhappiness and deprivation that follow poor academic performance for the learners, many parents spend lots of their financial resources to secure good schools for their children, and those parents who can afford it even invest in education abroad as they believe this will enhance the academic performance of their children. This desire for a high level of performance among students in secondary schools puts much pressure on students, teachers, psychologists, and, in general, the education system itself (Obilor & Sakpege, 2022). These problems have continued to persist and cannot be ignored.

However, there are many reasons for students' failure in school. Some of these factors might be from their homes or the school environment. Academic failure can be caused by various factors, such as learning disabilities, mismanaged personality traits, lack of motivation or engagement, poor study habits, or external stressors (Stat Analytical, 2019).

Much emphasis has not been placed on personality traits as an influencer of academic performance. Students' academic performance has been the central focus of the educational system, awarding credit to the cognitive prowess of the students. While students' cognitive abilities reveal what they can do, their personality traits reveal what they will do, exposing their tendencies if such traits are appropriately harnessed. The problem of this study question is, what is the impact of personality traits on the academic performance of biology students in Makurdi, a local government area of Benue State?

Purpose of the Study

The current study investigated the impact of personality traits on the academic performance of biology students in the Makurdi local government area of Benue state. A personality trait is an inherent attribute or unique quality a student possesses that can influence their behavior and academic performance. Specifically, this study seeks to:
1. Identify the personality traits of students studying secondary school Biology.
2. Determine the performance of students who offer Biology in the five personality traits.
3. Find out the difference between the performance of boys and girls in the five personality traits that are offered in Biology.

Research Questions

The following research questions were answered in the present study:
1. What personality traits are prevalent among secondary school Biology students in Makurdi Metropolis?
2. What is the mean performance of students of the five personality traits who offer Biology?
3. What is the difference in the mean performance of students in each of the five personality traits based on gender?

Hypotheses

The following null hypotheses guided this study and were tested at a .05 level of significance:
1. There is no significant difference among the mean performances of students of the five personality traits who offer Biology
2. There is no significant difference between the mean performance of boys and girls in each of the five personality traits.

Methodology

Design

The methods and procedures employed by the researcher in this study are discussed in this section. The research design used was the descriptive survey research method. This design is considered appropriate for this study because it involves administering questionnaires to a sample of students to collect data regarding the impact of personality traits on the academic performance of secondary school Biology students in Makurdi Local Government Area of Benue state, Nigeria.

Population, Sampling Technique, and Sample

The population for the present study was from the twenty public secondary schools in Makurdi Local Government Area of Benue State, Nigeria. The study targeted Biology students in secondary schools. The estimated population of these students at the time of the research was 9,748 (statistics from the Directorate of Planning Research and Statistics, Benue State Teaching Service Board, 2023).

Taro Yamane sampling techniques were employed to select 328 students randomly selected from the total population of 9,748. Only five secondary schools were selected from 20 government secondary schools in Makurdi Local Government Area of Benue State, Nigeria.

Instrumentation

The research instrument used for the current study was a written questionnaire, which includes the Five Factor Inventory Questionnaire (FFIQ) for personality traits and the Biology Performance Test (BPT). The researcher adapted the Five Factor Inventory Questionnaire (FFIQ) instrument and Biology Performance Test (BPT) to investigate the perceived impact of personality traits on the academic performance of secondary school Biology students. Academic performance was obtained using a point average from their three-term results. Thus the maximum average score per student is 5 points and the minimum is 0 points.

The questionnaire comprises standardized questions structured to appropriately elicit helpful information from the respondents. The questionnaire is divided into two sections: section A, which consists of the bio-data of the respondents and section B, which consists of the 20 items. The Five Factor Inventory Questionnaire (FFIQ) was structured along the four modified Likert points of scale from 4 = *strongly agree* to 1 = *strongly disagree*. Two lecturers from the Department of Psychology and the Department of Science Mathematics Education in the Faculty of Education, Benue State University, Makurdi, Nigeria, validated the research instruments. Both found the instruments satisfactory and suitable for this research. The Five Factor Inventory Questionnaire (FFIQ) for personality traits and Questionnaire for Academic Performance (QAP) was administered to secondary school Biology students as the primary tools for data collection.

Data Collection

The researchers collected the data through actual visits to the Makurdi Local Government Area schools. The structured questionnaires were administered by the researchers and collected to avoid the loss of any questionnaire in order to ensure a 100% return rate. The data collected from this research were analyzed quantitatively. The three research questions were answered using mean and standard deviations. However, hypothesis one was tested using ANOVA, while hypothesis two was tested using an independent *t*-test for the respective personality trait. The questionnaire was scrutinized for accuracy, then coded and entered into the computer using the Statistical Package for Social Sciences (SPSS).

Results

The data were presented using tables following the research questions and hypotheses which guided the study.

Research question 1: What are the mean personality traits ratings of students offered biology in Makurdi Local Government Area, Benue State?

Table 1
Descriptive Statistics for the Mean Personality Traits of the Students

Trait	n	Min.	Max.	M	SD
Openness	61	3.00	3.80	3.39	.18
Conscientiousness	77	3.00	3.70	3.38	.15
Extraversion	79	3.05	3.75	3.40	.15
Agreeableness	84	2.95	3.70	3.40	.16
Neuroticism	27	3.05	3.70	3.38	.15

Note. Min. = minimum; Max. = maximum.
N = 328.

Data in Table 1 show 61 students had an openness factor rating of (M = 3.39, SD = .18). Score on the conscientiousness factor, 77 students rated (M = 3.38, SD =.15). Seventy-nine participants rated (M = 3.40, SD = .15) to extraversion factor. At the time of study for the agreeableness factor, 84 students rated (M = 3.40, SD = .16). The secondary schools, 27 students reported (M = 3.38, SD = .15) for the last neuroticism factor.

Research question 2: What is the mean performance of students of the five personality traits who offer Biology?

Table 2
Descriptive Statistics for the Performance According to Personality Traits of the Students

Trait	n	M	SD
Openness	61	2.20	.57
Conscientiousness	77	2.35	.64
Extraversion	79	2.35	.61
Agreeableness	84	2.38	.62
Neuroticism	27	2.52	.62

Note. N = 328.

The data in Table 2 show that 61 students exhibited the trait of openness (M = 2.20, SD = .57), while 77 of the students exhibited the trait of conscientiousness (M = 2.35, SD = .64). Also, 79 of the students exhibited the trait of extraversion (M = 2.35, SD = .61), while 84 of the students who exhibited the trait of agreeableness (M = 2.38, SD = .62) and 27 of the students exhibited the trait of (M = 2.52, SD = .62).

Hypothesis 1: There is no significant difference among the mean performances of students of the five personality traits who offer Biology.

Table 3
ANOVA Results of Performance of the Students According to Personality Traits

ANOVA			SS	df	MS	F	p
Between Groups	(Combined)		2.21	4	.55	1.48	.21
	Linear Term	Unweighted	1.87	1	1.87	4.50	.03
		Weighted	1.74	1	1.74	4.66	.03
		Deviation	.47	4	.16	.416	.74
Within Groups			120.62	323	.37		
Total			122.83	327			

Note. SS = sum of squares; MS = mean square.

Results in Table 3 show no significant difference (F = .42, p = .74 > .05) among the students' performance according to their personality traits. Thus, the hypothesis, which states that no significant difference exists among the mean performances of students of the five personality traits who offer Biology, is not rejected. This implies that the students performed at the same level irrespective of their personality traits.

Research question 3: What is the difference in the mean performance of boys and girls in each of the five personality traits?

Data in Table 4 show that the mean difference between boys and girls in the openness category is .03, in the conscientiousness group .06, in the extraversion category .07, in the agreeableness section .07. In the Neuroticism category, the difference is .05.

Hypothesis two: There is no significant difference between the mean performance of boys and girls in each of the five personality traits.

Table 4

Descriptive Statistics for Performance on Personality Traits Based on Gender

Trait	Gender	*n*	*M*	*SD*	MD
Openness	Boy	29	2.21	.57	.03
	Girl	32	2.19	.57	
Conscientiousness	Boy	52	2.33	.63	.06
	Girl	25	2.39	.65	
Extraversion	Boy	47	2.32	.58	.07
	Girl	32	2.39	.66	
Agreeableness	Boy	40	2.42	.67	.07
	Girl	44	2.35	.57	
Neuroticism	Boy	14	2.54	.69	.05
	Girl	13	2.49	.56	

Note. MD = mean difference.
N = 328.

Table 5

Independent Samples t-Test for Mean Difference in Performance of Boys and Girls in the Five Personality Traits

Factor	Gender	*n*	*M*	*SD*	*df*	*t*	*p* (2-tailed)
Openness	Boy	29	2.21	.57	59	.18	.86
	Girl	32	2.19	.57			
Conscientiousness	Boy	52	2.33	.63	75	-.39	.70
	Girl	25	2.39	.65			
Extraversion	Boy	47	2.31	.58	77	-.49	.63
	Girl	32	2.39	.66			
Agreeableness	Boy	40	2.42	.67	82	-.55	.58
	Girl	44	2.35	.57			
Neuroticism	Boy	14	2.54	.69	25	.21	.84
	Girl	13	2.49	.56			

Note. N = 328.

Table 5 indicates that there is no significant difference between the performance of the boys and girls in the openness trait group, where t (59) = .18, p = .86 > .05; in the conscientiousness trait group where t (59) = -.39, p = .70 > .05; in the extraversion trait group where t (59) = -.49, p = .63 >.05; in the agreeableness trait group where t (59) = .55, p = .58 > .05 and in the neuroticism trait group where t (59) = .21, p = .84 > .05. Since there is no significant difference in all the five sub-traits, hypothesis two is not rejected. This implies that boys and girls who offer Biology performed at the same level between the groups of personality traits.

Discussion

The present study investigated the impact of students' personality traits on their performance in biology in Makurdi Local Government Area of Benue state. On the impact of personality traits on students' performance, this study found no significant difference among the mean performances of students of the five personality traits who offer Biology. This is because the homogeneity of the traits in the sample used consists of students with similar personality traits, and as a result, the mean performances did not differ significantly. This finding disagrees with Aba and Isa (2019), who revealed that there is a significant relationship between the personality traits and academic achievement of NCE students. It also disagrees with Alexandros et al. (2013), who stated that academic performance correlated with extraversion, conscientiousness, and emotional stability in the case of Greek university students. This finding also disagrees with Fehintola (2014), who showed a significant relationship between conscientiousness, agreeableness, openness, extraversion and neuroticism personality traits and academic performance among secondary school students in the Saki-west Local Government Area of Oyo State. Except for conscientiousness, there is agreement with Vedel (2014), who aggregated the 2l categories of empirical research into the "Big Five" personality characteristics and average performance (GPA) and was able to show that the significant positive impact of conscientiousness is reflected in all the studies, while the negative impact of emotional stability is

relatively standard. Further, some studies found that agreeableness and openness positively impact average performance, but the significance is weak, while extraversion has no significant impact. Similarly, by summarizing empirical evidence, Wang et al. (2023) found that some personality traits, such as openness to experience and agreeableness, do not have an impact on academic performance in adolescence, while the personality trait consciousness plays an essential role in every age category of students.

Based on gender, this study found that boys and girls had similar personality traits; hence, there was no significant difference in the personality traits of students according to gender across the five personality traits. Also, the study found that male and female students performed at par with one another; hence, there was no significant difference in students' performance according to gender. This is because the educational system provided equal opportunities and eliminated gender bias in Biology for both boys and girls. The finding agrees with Goni et al. (2015), who revealed no significant differences between male and female students' academic performance. It does not agree with Unity and Igbudu (2015), who stated that there is a gender difference in students' academic achievement.

There are obvious implications of this study for researchers and classroom managers. Most findings of this study disagreed with many previous studies, which imply that the issue is not conclusive with particular reference to the study area. Secondly, the data sample size obtained in this study is small, and the robustness of the related conclusions needs to be verified in a wider range of research.

Conclusion

The study concluded that although Biology students in Makurdi Local Government Area have positive personality traits, there was no significant impact of the traits on performance in the subject. Also, gender was not a variable to be considered concerning its influence on personality traits to affect Biology students' performance.

Recommendations

Based on the findings, the study recommended that:
1. Particular attention should be paid to improving students' performances in Biology in Makurds to strike an association between the traits.
2. Boys and girls should be given equal opportunities in Biology since there is no gender differential concerning their personality traits and performance.

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