Influence of Conscientiousness Personality Trait on Mathematics Achievement among Senior Secondary School Students in North-West, Nigeria

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Abstract

This study investigated influence of conscientiousness *personality trait on achievement in mathematics among senior secondary school students in North-West, Nigeria. Two hypotheses were formulated and tested. Research design used was Ex post-facto. The population of the study was 487,769 senior secondary school students. A sample size of 384 was selected based on the Research Advisor Table of Population and Sample Size. Researchers administered Conscientiousness Personality Trait Scale to the students and it was found that only 77out of 384 students were found to display conscientiousness personality trait. The Conscientiousness Personality Trait Scale was used as data collection instrument. Face and convergent validity were used by the lecturers in Bayero University, Kano to validate the instrument. The convergent validity of the conscientiousness personality trait was 0.721. Students' 1st and 2nd terms examination scores which were standardized using T-score were used as students' achievement in mathematics. Cronbach alpha reliability index of conscientiousness personality trait was 0.726. Pearson Product Moment Correlation and t-test unrelated sample were used to analyse the data. The result of the analyses showed that there was positive significant relationship between conscientiousness personality trait (r=0.631) and mathematics achievement among senior secondary school students in North-West, Nigeria. Based on the findings of the study, it was recommended that counsellors should help guide parents and teachers on how to train children so that they can grow up with conscientiousness personality trait because it is responsible for good mathematics achievement.*

Keywords: Conscientiousness, Personality, Trait, Achievement.

Introduction

The concept of Personality Traits was developed by psychologists to provide the most widely accepted structure of personality in this time. These personality traits popularly known as

the 'Big Five' include: Agreeableness, Conscientiousness, Extraversion, Neuroticism and Openness to experience. These personality traits affect academic performance senior secondary school students either positively or negatively. The roles conscientiousness personality trait of students play towards achievement in mathematics cannot be over-emphasized. At the same time, conscientiousness personality trait of an individual student cannot be ignored because this trait is one of the factors affecting students' achievement in mathematics (Daminabo, 2018). There are different traits of personality and these traits contribute to the achievement of every student in mathematics in one way or the other. Predictors of achievement in mathematics lay on students' conscientiousness personality trait. Educators have always asked whether students' conscientiousness personality trait can help them attain higher academic performance. The continuity of the effect of childhood personality traits on achievement and gender, is worthy of much attention because students' academic achievement is believed to have cumulative effects in the cause of time. Conscientiousness reflects an individual broad-mindedness, depth of attitude and penetrates awareness; it is a need for generalizing and testing out experiences. Many personality theories, trait models emphasizing individual differences in thoughts, feelings, and behaviours assume that personality consists of several dispositions. Since personality traits tend to form a stable pattern of reactions in any given situation, they can explain the mechanisms of an individual's information behaviour with little variability (Holly & Andrew, 2019).

The knowledge of mathematics at all levels of education namely: primary, secondary and even sometimes tertiary levels cannot be neglected because mathematics is needed by every student, regardless of his/her field of study. Cattigan (2019) opined that, knowledge of mathematics will enable the students to conduct research and be able to analyze the data collected and it will also help in the interpretation of results without any difficulties. All educational institutions made it compulsory for all candidates to offer mathematics at the same time pass it at credit level, as it is made one of the prerequisite for admission into any higher institution of learning. Lenoard (2018) affirmed that Northwest indigenes have some brighter minds, who even under stressful conditions of learning (e.g. unstable electricity, lack of potable water in some schools or on college campuses, absence of high-speed internet, e.t.c) manage to demonstrate skills that are in high demand in mathematics education.

Academic achievement of students in mathematics is an important indicator of academic success at senior secondary school level. Senior secondary schools students differ in how they process, encode, recall, organize and apply information they learn (Digman, 2021). Psychologists have put forward a lot of reasons why these disparities in achievement exist. Opinions vary as to why some students excel academically while others appear to be under achievers. Many psychologists have consistently attempted to identify the major predictors of individual academic performance. Factors such as personality traits, gender, study habit, peer group influence, socio economic background amongst others, just to mention a few, have been extensively explored as being responsible for academic achievement. One major factor that is believed to be responsible for academic performance in students is their personality traits and gender. Adewale and Taiwo (2007) in Dahira (2011) defined academic achievement as individuals inherent potentials in terms of intelligence combined with other sociological factors. Also, Saka, Sam and Yusuf (2016) submitted that academic achievement is what is measured regarding skill or knowledge developed through specific instruction or training with emphasis on how well instructional objectives have been attained. This means that, the measurement of achievement represents all abilities that can be evaluated on the basis of observing the individual as he performs the task involved, Dahiru (2011). Academic achievement which stands as students' examination scores is a dependent variable depending on conscientiousness personality trait. Academic achievement can be understood as a display of knowledge attained or skills developed in schools subjects designed by test and examination scores or marks assigned by the subjects' teachers.

A number of researches have been conducted in relation to conscientiousness personality trait and academic achievement, Ibrahim (2016) conducted a research to find out relationship between personality traits and academic achievement in biology among senior secondary school students in Katsina State, the population of his study was 3024 senior secondary school students and the sample size was 331. Correlational study was the research design of the study. The instruments used were biology academic achievement scores of students and Goldberg (1993) marker of the big five factor structure in psychological assessment. It was found that there was that there were positive relationships among students' biology academic achievement and agreeableness, conscientiousness, openness to experience but found a negative relationship between students' biology academic achievement and neuroticism. This study is similar with the

present study because it uses conscientiousness personality trait as an independent variable but different with the present study because he used biology as his academic performance scores.

According to the theories of Goldberg (1993) opined that conscientiousness personality trait students are curious about both inner and outer worlds and their lives are experimentally richer and they are willing to entertain novel ideas that favour academic achievement. Student with Conscientiousness personality trait displays feature such as competence, orderliness, self-discipline and positive emotion. Among the Big- five personality traits, conscientiousness personality students involves in one of the highest cognitive aspects and Individuals with a high level of conscientiousness to development are good in mathematics. Also, conscientiousness personality trait is generally related to mathematics achievement, hard work, success-orientation, high levels of thought fullness, with good impulse control and goal directed behaviours and mind fullness (Costa & McCrae, 2015).

Tolkemit (2019) gender could be defined as the social forming of the biological sex. Gender is built on biological differences and transfuses those biological differences into areas where it is completely groundless. Individual is not born with a specific gender; rather gender is how we behave. Ezeh (2018) defined gender as social responsibilities as well as responsibilities shouldered by males and females and the unions between women and men; girls and boys, as well as the relations between women and men. The biosocial approach is an interactionist approach where by nature and nurture both play a role in gender development. Money (1972) theory was that once a biological male or female is born, social labeling and differential treatment of boys and girls interact with biological factors to steer development. This theory was an attempt to integrate the influences of nature and nurture on male and female students' mathematics achievement and conscientiousness personality traits development. Jackson (2019) opined that people in the society are fond of limiting female students' possibilities, regardless of their outstanding academic performance. Okeke (2008) and Nwajiuba (2020) were of the views that in schools, male students are fond of difficult subject like mathematics while their female counterparts prefer subjects like humanities and languages.

In study, conducted by Alireza, Babak, and Hossein (2018) titled investigation of the role of gender in determining academic achievement in mathematics and personality traits of senior secondary school students. The method used was the statistical populations were 200 students from

distance education students system of Mazandaran province that were randomly selected and responded to five - factor personality test (NEO - FFI). Total scores of personality traits and mathematics were analyzed with descriptive statistics (mean, variance and standard deviation) and inferential statistics with Pearson correlation coefficient. Results: The result showed positive and significant correlation of Conscientiousness with learning mathematics and academic achievement.

The statistics of the results of West African Examinations Council (WAEC) 2021 and 2022 and National Examination Council (NECO) 2021 and 2022 according to the Registrars of the two Examination Bodies WAEC, Olu (2022) and NECO, Abubakar (2022) showed that 59.70% of students across the federation passed mathematics at credit level while North-West States Directorate of Planning, Research and Statistics of the Ministries of Education revealed that 34.25% passed at credit level. Researchers are of the opinion that if this failure persists for another subsequent two years, the Northwest states educational system will be at the verge of collapse because nobody cares to take into consideration psychological constructs of the students which may be the main reasons behind this failure.

Researchers who have worked on ways to improve students' achievement in mathematics in North-West states, have failed for not taking into considerations psychological constructs which may be factors militating against students' good achievement in mathematics for so many years. Northwest Zone governments have been investing a lot on the recruitments of qualified and competent mathematics teachers in senior secondary schools but all effort proved abortive, instead the achievement is in decline. In 2022, the North-West governments through their various ministries of education employed thousands of thousands of teachers; of which almost half of the teachers employed were mathematics teachers. This is to improve the students' achievement regarding mathematics but this yielded no positive result as the students' achievement keeps declining. The governments also created extra mural classes after school hours for senior secondary school students to be taught mathematics but yet the condition remains the same.

Parents who have been investing in their children's education felt unhappy whenever their children fail mathematics. Some of the parents have been spending on hiring mathematics teachers to teach their children mathematics so that they can improve but yet the result is alarming. On the

purchase of textbooks, a lot have been spent by the governments and parents whom everyone believes will improve students' achievement in mathematics but this has not yielded good results.

The fact that all the endevours made by aforementioned stallholders to improve students' achievement in mathematics did not include the study of students' conscientiousness personality trait and gender difference, an avenue to suspect conscientiousness personality trait and gender difference towards mathematics as culprits behind this mathematics failure among senior secondary school students. The investigation of influence of this psychological variable (conscientiousness personality trait) on students' achievement in mathematics will unravel the reasons behind this failure and this will enable all the stakeholders in North-West States senior secondary school education to provide lasting solutions to this massive failure. The study will also unravel whether difference exists in conscientiousness personality traits of male and female students. It is in view of this that the researcher will embark on this research with the aim of bringing solutions to these problems.

Purpose of the Study

i. To find out if there is relationship between conscientiousness personality trait scores and mathematics achievement scores among senior secondary school students in North-West, Nigeria.

ii. To find out if there is gender difference in the conscientiousness personality trait scores of male and female senior secondary school students in North-West, Nigeria.

Research Questions

i. Is there relationship between conscientiousness personality trait scores and mathematics achievement scores among senior secondary school students in North-West, Nigeria?
ii. Is there gender difference in the conscientiousness personality trait scores of male and female senior secondary school students in North-West, Nigeria?

Hypotheses

1. There is no significant relationship between conscientiousness personality trait scores and mathematics achievement scores among senior secondary school students in North-West Geo-Political Zone.

2. There is no significant gender difference in the conscientiousness personality trait scores of male and female senior secondary school students in North-West, Nigeria?

Methodology

The research design was Expo-Facto. In this type of research, the researcher didn't have direct control of the independent variable. The researcher used this design because the independent variable (conscientiousness personality traits) cannot be manipulated since its manifestation has already occurred. Koleoso (1999) in Jackson (2019) stated that an ex-post facto research design is a method in which groups with qualities that already exist are compared on dependent variable. The population for this study is public senior secondary school two (SS II) 2022 students with a total number of four hundred and forty eight thousand, seven hundred and sixty nine (487,769) in North-West Geo Political Zone. North-West Geo-Political Zone is made up of seven States. Some of the schools were male students only, some were female students only and a number of them were mixed. The researchers conducted his study in three States which were Katsina, Kaduna and Zamfara States. The sample size of the study was 384 out of the population of 487,769 which was in line with the table of Research Advisor Table of Population and Sample Size (2006). Conscientiousness Personality Trait Scale were administered to 384 students that consisted the sample size of the study, only 77 students possessed conscientiousness personality trait. The researchers used multi-stage sampling techniques. This means the selections of the subjects from the population involved more than one sampling technique. These techniques are cluster, simple random, stratified and systematic sampling techniques.

The instrument used was Conscientiousness Personality Trait Scale (OEPTS) which is one of the Sub-Scales of the Big Five Personality Traits developed by Goldberg (1999). Face and convergent validity were cinducted by the lecturers in Bayero University, Kano to validate the instrument. Convergent validity was used to find out whether the instrument measures the construct it's actually claims its measures on like concurrent validity that establishes the extent to which new instrument correlates with existing and already validated instrument. The two instruments (Conscientiousness Personality Trait by Goldberg, 1993 and Conscientiousness Personality Trait by John and Srivastava, 1999) were common because they have five items that measure Conscientiousness personality trait. The convergent validity of the two instruments was 0.721, meaning that the instrument is valid to be used for the research work. Also, researchers used

Cronbach Apha formula to establish the reliability of internal consistency of the Conscientiousness Personality Trait Scale by administering the instrument to 20 students of GSSS Bagwai, Kano. This is because the researchers were interested in finding out how compatible the items on the instruments are. The reliability index of Conscientiousness was a= 0.726 which showed that the instrument is reliable because the value is more than the minimum Cronbach Alpha value required (0.700). The 1st and 2nd terms average mathematics examination scores were used as students' academic achievement. These mean scores obtained were standardized for the sake of objectivity using T-Score formula. To convert any raw score into T- score, the scores were first converted into Z-score using the formula, Z = (observed score – mean)/ standard deviation. Both mean and standard deviation were constant; the mean score of the distribution was 56 while the value of standard deviation was calculated to be 8.76. These values were substituted in the Z-Score formula to obtain the value of Z- score for each raw score. Finally, the Z-score values were substituted into the T-score formula to obtain standardized scores. This is because T-scores were expressed on 100 point scale or on a scale of 100 point. T-score = 10Z + 50, where 10 was multiply constant and 50 was additive constant.

Results

The data collected were analyzed as follows:

Hypothesis One: There is no significant relationship between conscientiousness personality trait scores and mathematics achievement scores among senior secondary school students in North-West, Nigeria.

Pearson r correlation was used to test this hypothesis at 0.05 level of significance and the result of the analysis is presented in below.

Table 1: Pearson r correlation between conscientiousness personality traits scores and mathematics achievement scores.

Data	N	Mean	SD	r-value	p-value	Remark
Conscientiousness	77	58.644	6.112	0.631	0.00	Significant
Mathematics Achievement	77	57.097	6.007			

The table above shows the correlation between conscientiousness personality traits scores and achievement in mathematics scores. The result of the analysis indicated strong positive correlation between conscientiousness personality traits scores and achievement in mathematics scores r = .631, p=.000, p<.05). By implication, any student who possesses this type of traits will do well in mathematics and an increase in these traits scores causes increase in achievement in mathematics scores. Hence the null hypothesis was rejected, meaning that conscientiousness personality trait positively related and contributes to achievement in mathematics.

Hypothesis Two: There is no significant difference in conscientiousness personality trait mean scores between male and female senior secondary school students in North-West, Nigeria.

Independent sample t test was used to test this hypothesis at 0.05 level of significance and the result of the analysis was presented in the table below:

Table 2: Independent sample t test for conscientiousness personality trait mean scores between male and female students

Gender	N	Mean	SD	df	t-value	p-value	Remark
Male	41	5.13	2.92	75	1.331	0.058	Rejected
Female	36	4.99	2.31				

Independent sample t test was conducted to compare male and female students' conscientiousness personality trait mean scores. The result on the table above indicated no significant difference between male and female students' conscientiousness personality trait mean scores (0.058 > 0.05). Hence, the null hypothesis which stated that there is no significant difference in achievement in mathematics mean scores among senior secondary school students in North-West Geo-political Zone of Nigeria was accepted.

Discussions of Findings

The test of hypothesis one revealed that there was significant relationship between conscientiousness personality trait scores and mathematics achievement scores among senior secondary school students in North-West, Nigeria. The study was in congruent with the study of Ibrahim (2016) who conducted a research to find out relationship between conscientiousness personality trait and academic achievement in biology among senior secondary school students in

Katsina State. He found that there was positive relationship among students' biology academic achievement and conscientiousness personality trait.

The test of hypothesis two indicated that there was no significant gender difference in conscientiousness personality trait means scores between male and female senior secondary school students in North-West, Nigeria. The study was in line with the study of Alireza, Babak, and Hossein (2018) that investigated the role of gender in determining personality traits and academic achievement in mathematics of senior secondary school students and found no significant difference in conscientiousness personality traits of male and female students. The current finding disagreed with Bi-social Approach to gender, which stated that there is an interactionist approach where by nature and nature both play a role in gender disparity, the social labeling and different treatments given to boys and girls in terms of development regarding to their personality traits development.

Conclusion

Relationship exists between conscientiousness personality trait and achievement in mathematics. According to the Big Five Personality Theories, students with this type of personality traits possess good ideas, feelings and values, meaning the more these characteristics, the better the achievement in mathematics. Gender difference did not exist in conscientiousness personality trait scores. The finding against theories of bi-social approach to gender which postulated that difference exist in male and female personality traits.

Recommendations

1. Conscientiousness personality trait contributes to good achievement in mathematics; therefore, counselors should counsel parents on how train their children in such a way that will make them grow up with this type of trait.
2. The same treatment should be given to male and female to enable both sexes grow up with conscientiousness personality trait as to discourage gender disparity.

References

Abubakar, G. (2022). Breakdown of june/july 2022 SSCE result. https://www.myschoolgist.com/ng/neco-results-statistics/, retrieved on January, 2022.

Costa, P.T.& McCrae, R.R. (2018). Gender difference in personality traits across culture. *Journal of Personality and Social Psychology, 81* (4), 322-331.

Dahiru, B.W. (2014). *Effects of Mathematics Improvement Project (M.I.P.) on Students' Performance and Perception in Senior Secondary School Mathematics in Katsina State*. Unpublished Thesis in Ahmadu Bello University, Zaria.

Daminabo, W.H. (2018). T*he relationship between personality traits and academic achievement of Secondary School Students in Rivers State*. Unpublished M.Ed. dissertation, University of Port-Harcourt.

Digman, J.M. (2021). Personality Structure. Emergence of the five factors model. *Annual review of psychology*, *4* (1), 417-440.

Ezeh, D.N. (2013). Science Without Women: A Paradox. 75th Inaugural lecture of the University Nigeria, Nsukka.Delivered on 30th May, 2013. Nsukka: University of Nigeria Senate Ceremonial Committee.

Goldberg, L. R. (1993). The development of makers for the Big-Five factors structure. *Journal of Psychological Assessment, 4* (1), 26-42.

Holly, M. A. & Andrew, J. E.. (2019). The shame of failure: Examining the link between fear of failure and shame. *Personality and Social Psychology Bulletin*, *31* (1), 218-231.

Ibrahim, B. (2016). *Relationship between personality traits and academic achievement in biology among senior secondary school students in Katsina State.* Unpublished thesis, Umaru Musa Yara'adua University, Katsina.

Jackson, S. (2019). New teaching methods improve the educational process. Retrieved from www.gettingsmart.com-new-teaching-methods-improve-educational-process/on 4/2/2015

John, O. P. & Srivastava, S. (1999). *The big five trait taxonomy: History, measurement and theoretical perspectives*. In L.A. research (2nd ed). New York: Guilford, p. 35-89.

Leonard, K. S., (2018). The State of Education in Nigeria. Part 1. www.nationalaccordnewspapper.com/state-education-nigeria-part-1-leonard-karshima-shilgba/, retrieved on 8th January, 2023.

Money, J. & Ehrhardt, A.A. (1972). *Man and woman, boy and girl: differentiation and dimorphism of gender identity from conception to maturity*. pp 78-89.

Nwajiuba, C. (2020). Culture and sex imbalance in higher education in Nigeria: Implications for development. *Journal of Educational Research, 2* (3), 926-930.

Okeke, E.A.C. (2018). Clarification and analysis of gender concepts. Focus on research, reproductive health education, and gender sensitive classrooms. *Journal of Science Teachers Association of Nigeria, 2* (1), 5-8.

Olu, A. (2022). West African examination council may/june results statistics for 2022/2023.

Ravendran, T., Raveeswaran, M. & Ananthasayanan, S. (2019). Impact of personality traits on academic success of university undergraduates: A case study of university of Jaffna using big five personality traits theory. *Journal of Educational Psychology, 4* (2), 105-118.

Research Advisors (2006).References.Retrieved on the 5th April, 2021 from http://research-advisors.com/tool/SampleSize.htm.

Saka A. O., Sam, E.O. & Yusuf, K. (2012). *Educational Psychology*: Introduction, Zaria Tamaza publishing company Ltd. Pp. 56 – 77.