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Students Perception of Teachers' Pedagogical Knowledge and Personality Traits as Correlates of Students' Achievement Motivation in Biology

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Abstract
The study was carried out to determine students' perception of teachers' pedagogical knowledge and personality traits as correlates of students' achievement motivation in biology. Three research questions and three corresponding hypotheses were formulated and tested at $p<0.05$ level of significance. The researcher adopted a correlational survey research design. The population of the study was 3,053 senior secondary school students in the public secondary schools in Awka Education zone of Anambra state. A multi-stage sampling procedure was used to sample 355 senior secondary class two students for the study. Three instruments titled; Students' perception of Biology teachers' pedagogical knowledge questionnaire (SPBTPKQ), Students' perception of Biology teachers' personality traits questionnaire (SPBTPTQ) and Rating scale on biology students achievement motivation (RSBSAM) were developed by the researcher and used for data collection. Research question one and two were answered using Pearson product moment correlation coefficient (PPMCC) while research question three was answered using multiple regression analysis. Also, hypotheses 1 & 2 were tested at 0.05 level of significance using linear regression while hypothesis three was tested using multiple regression analysis. Nwana's interpretation of 'r' value was adopted in order to describe the relationship among the variables. Findings reveal that, there were moderate positive relationship ($r = 0.457$) among students' perception of teachers' pedagogical knowledge, biology teachers' personality traits and students' achievement motivation in biology.
Keywords: Pedagogical Content Knowledge, Attitude, Biology Teachers, Achievement
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Introduction

Teaching is the process of incorporating new knowledge, behaviours, and skills in a learner. The process involve in teaching is made achievable through the teacher who is the instructor. In the aspect of education, teachers' instruction is based on the subject area of specialization which could be in science or art subjects. Science subject is a multi-disciplined academic field for students who intends to learn the principles of medicine, physics, chemistry, and biology through observation and experiment (Nduji, Okechukwu & Kemsi, 2019). Biology is a subject that requires the processes and skills of science, through laboratory experiences, to understand concepts in practical and similar situations, in everyday life (Chinweuba-eze, 2021). Biology could be seen as an approach on the basis of levels that deal with fundamental units of life.

Biology is one of the science subjects taught in senior secondary school in Nigerian. The study of biology is expected to: provide the students with sound knowledge of the basic principles and techniques of biology; inculcate the process of inquiry into the living world; analyse the activities of living things in their environment; inculcate positive scientific attitude and value in the society; and promote positive disposition towards biology, science and the scientific enterprise (Federal Ministry of Education [FME], 2004). It is discouraging that these expectation of students in biology cannot be visualized as been fully achieved. This is because there is still inconsistency in the performance of students in biology external examinations like West African Examination Council (WAEC) (Okenyi, 2019), and National Examination Council (NECO) (Bichi, 2019). This could be attributed to teachers factor which include teachers' pedagogical knowledge, personality traits, involvement, content knowledge, amount of content and time allocated by the teacher, English language skills as medium of instruction (Basil, 2021). However, out of all the aforementioned factors of inconsistent performance of students in biology, the researcher would explore more on the teachers' pedagogical knowledge. This is because pedagogy involves both method and practices use in teaching and learning of concepts.

Pedagogy is the study of how knowledge and skills are imparted in an educational context, and it considers the interactions that take place during learning. The pedagogy adopted by teachers shapes their actions, judgments, and other teaching strategies by taking into consideration theories of learning, understandings of students and their needs, and the backgrounds and interests of individual students (Freire, 2018). Thus, when people talk about the pedagogy of teaching, they will be referring to the way teachers deliver the content of the curriculum to a class. This pedagogy of teaching encompasses teaching styles, teaching theory, feedbacks and

assessment. To Nduji, Nwandikor, Keziah & Elejere (2020), pedagogy is broken down into four categories: behaviourism, constructivism, social constructivism, and liberationist. To this end, there is need for the teacher to possess the required facts, information, and skills through theoretical or practical understanding of pedagogical approaches, often referred to as pedagogical knowledge.

Pedagogical knowledge is described as the awareness of the principles and strategies of classroom management and organization that are cross-curricular. This implies that with pedagogical knowledge the teacher can create an effective teaching and learning environments for all students. This is inline with the views of Nduji, Okechukwu and Kemsi (2019) who argued that pedagogical content knowledge depends on the teacher's familiarity, beliefs and goals relating to teaching. Pedagogical knowledge plays an important role in the teaching process because it involves teachers' competences in delivering the conceptual approach, relational understanding and adaptive reasoning in the classroom. In the aspect of biology teaching, teachers' pedagogical knowledge is very important since it makes the teacher become more flexible on the most stable pedagogical approach to use so as to help students map their own ideas, relate one idea to another, and re-direct their thinking to create powerful learning outcome. However, teachers' utilization of pedagogical knowledge in the classroom in addressing students' curiosity puts diverse students on having different perception about their knowledge of pedagogy. In the same vein Benson, Nwagbo, Ugwuanyi and Okeke (2020) agreed that an effective use of pedagogical skills that addresses students' curiosity will change their behaviour and perception of the subject and the teachers' skills while teaching. The researchers further narrated that students' perception about their classroom activities should not be neglected.

Perception is the process of taking in, selecting, organizing, and comprehending sensory information. This entails gathering information from the sense organs and processing it in the brain. Once a student is engaged in this process, it is termed student perception. According to Hazari (2014) students' perception is described as students' thoughts, beliefs and feelings about persons, situation or events. From the definitions, we can say that students' perception of teachers' pedagogical knowledge is the experience possessed by the student in organizing objects, events or relationship leading to the process by which they can interpret their teachers' awareness of teaching approaches. Students' perception about their teachers' pedagogical knowledge involves recognizing both environmental stimuli and actions in response to these stimuli through the teacher utilization of teaching approaches. Additionally, there is evidence that student perceptions of teachers' pedagogical knowledge is more predictive of student learning outcomes than other methods such as external observations or teachers' subjective perceptions of their own teaching behaviour (Maulana et al., 2015). On the other hand, Adela (2009) argued that student perceptions teachers' pedagogical knowledge and personality traits is paramount in ensuring an improved academic achievement of their students. This is because students' familiarity with their teachers' pedagogical knowledge and personality traits will help explain their behaviour than the well-intentioned inferences sometimes made by teachers. Thus, the need to study the variable of teachers' personality traits in this study.

Personality traits are the individual differences in character that exist from person to person. Personality is the sum total of the characteristics that differentiate people, or the stability of a person's behaviour across different situations (Jimoh, 2022). This means that personality trait is a simple behavioural pattern, disposition or tendency to behave in a describable way. When the characteristic patterns of teachers make them behave in a particular way continuously in the school and outside the school environment, such is referred to as teacher personality traits. This implies that for a biology teacher in the classroom, various characteristics or behavioural display is obtainable. Soto (2018) asserted that there are five broad domains or dimensions of personality trats called the big five personality traits. They include; openness to experience, extroversion, agreeableness, neuroticism and conscientiousness. Openness to experience refers to the degree of intellectual curiosity, creativity and a preference for novelty and variety a person has. Extroversion is the tendency to be energetic in behaviour, positive emotions, assertiveness, sociability and the tendency to seek stimulation in the company of others, and talkativeness. Agreeableness is a measure of one's trusting and helpful nature, and whether a person is generally well tempered or not. Neuroticism is the tendency to experience unpleasant emotions easily, such as anger, anxiety, depression, and vulnerability. While conscientiousness means to do a task well and to take obligations to others seriously.

Previous researchers have carried out studies on the aspect of; personality traits and their influencing factors (Huiling, & Zhiyuan, 2022); personality traits and TPACK-web of pre-service teacher (Thohir et al., 2021); family function and personality traits (Zakiei et al., 2020); personality traits and achievement motivation of students in the tertiary institutions (Ude & Akintunde, 2020); personality traits and employment factors (Kai-Wen, 2020); personality traits and career role enactment (2019); personality traits and behavioural characteristics on schooling, earnings, and career promotion (Lee & Ohtake, 2014). It could be deduced from based on the reviewed literature that little or no studies has been carried out on personality traits and achievement motivation of students especially in biology. Thus, the need to investigate on the variable of achievement motivation of biology students.

Achievement motivation is the desire to perform well and be successful. This implies that the individual is accountable for the outcome (success or failure), that he expects clear knowledge of the findings, and that there is some uncertainty or risk. Gordon (2022) sees achievement motivation from the perspective of the need for achievement. The author further stated that achievement motivation is an important determinant of aspiration, effort, and persistence when an individual expects that his performance will be evaluated in relation to some standard of excellence. In the aspect of biology student, achievement motivation is said to take place once there is striving effort from the student to increase or to keep as high as possible their capabilities in all activities in which a standard of excellence is thought to be applied. Thus, achievement motivation is actualized when a dull or average student work so hard to become the brightest student in the classroom. Also, when the brightest student in the classroom is concerned about losing his or her intelligence, achievement motivation is said to be actualized. To this end, one could infer that the importance of students showing the required achievement motivation cannot be overemphasised because it plays a very crucial role in predicting students' future success or failure. On this background, therefore, the need for the researcher to investigate on students' perception of teachers' pedagogical knowledge and personality traits as correlates of students' achievement motivation in biology.

Research Questions

The following research questions were posed to guide the study;

1. What is the relationship between students' perception of teachers' pedagogical knowledge and students' achievement motivation in biology?
2. What is the relationship between students' perception of teachers' personality traits and students' achievement motivation in biology?
3. What are the relationships among students' perception of teachers' pedagogical knowledge, personality traits and students' achievement motivation in biology?

Hypotheses

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

1. There is no significant relationship between students' perception of teachers' pedagogical knowledge and students' achievement motivation in biology.
2. There is no significant relationship between students' perception of teachers' personality traits and students' achievement motivation in biology.
3. There is no significant relationship among students' perception of teachers' pedagogical knowledge, personality traits and students' achievement motivation in biology.

Research Design

The study adopted a correlation survey research design. In similar studies, Olagbaju (2020), Ihekwoaba, Chinweuba-eze and Nduji (2020), Adediwura and Tayo (2017) have adopted the same design.

Participants

The population of the study consisted of 3,125 SS2 biology students in the public secondary schools in Awka Education zone of Anambra state (Post Primary School Service Commission Awka [PPSSCA] 2021). Awka Education zone is made up of 5 local government area (LGA) with total number of 52 government owned senior secondary schools which include; Anaocha LGA (12), Dunukofia LGA (7), Njikoka LGA (7), Awka North LGA (7), and Awka South LGA (16). The sample size of the study was 355 SS2 biology students. The sample size was determined using Taro Yamane formular. Multi-stage sampling procedure was utilized to get the sample of the study using simple random sampling procedure and proportionate stratified random sampling. At the initial stage, simple random sampling was used to draw 2 LGAs from the 5 LGAs in Awka education zone. In the second stage, simple random sampling technique was used to select 8 government owned schools from each of the 2 LGAs. This gave a total of 16 schools drawn from the 52 government owned schools in Awka Education Zone. Thirdly, proportionate stratified random sampling was used to draw number of students to be studied in each school that was sampled from each LGA resulting to the total number of 355 SS2 biology students.

Measures and Procedures

Three instruments constructed by the researcher were used for the study. They are Students' perception of Biology teachers' pedagogical knowledge questionnaire (SPBTPKQ), Students' perception of Biology teachers' personality traits questionnaire (SPBTPTQ) and Biology students' achievement motivation questionnaire (BSAMQ). The SPBTPKQ has 20 items which are meant to determine how students perceive their biology teachers' pedagogical knowledge. The SPBTPTQ has 20 items which elicits information on students' perception of biology teachers' personality traits. The BSAMQ also has 20 item statement which are meant to get

information on biology students' achievement motivation. All the instruments used for the study were structured on a four-point Likert scale of Strongly Agree (SA) – 4 points, Agree (A) – 3 points, Disagree (D) – 2 points, and Strongly Disagree (SD) – 1 point.

Validation, Reliability and Data Collection

The validity of the instrument was ensured through the help of three experts in educational research measurement and evaluation, biology education and educational psychology. Their views corrections and suggestions were taken into consideration. Cronbach Alpha method was used to determine the reliability of all the instruments. The essence of using Cronbach Alpha was because items were polytomously scored. The reliability coefficient the instruments are as follow; BSPTPK (0.762), BSPTPT (0.722) and BSAM (0.831). The coefficient indicates high internal consistency which proved that the instruments were reliable for field work. On the spot method of administration and collection of data was used. Pearson product moment correlation coefficient (PPMCC) (r) was used to answer the research questions 1 and 2 while research question 3 was answered using multiple regression analysis. To test hypotheses 1 and 2, linear regression was used while multiple regression analysis was used to test the hypotheses 3. All the hypotheses were tested at 0.05 level of significance. However, the magnitude of Correlation Coefficient (r) was interpreted using Nwana (2008). In the interpretation, a value of 1.0 'perfect positive + association', 0.8 to 1.0 'very strong', 0.6 to 0.8 'strong', 0.4 to 0.6 'moderate', 0.2 to 0.4 'weak', and 0.0 to +0.2 'very weak or no association'. A pls (+) or (-) sign indicates whether the correlation is positive (association) or negative (no association).

Data Analysis

Result

Research Question One: What is the relationship between students' perception of teachers' pedagogical knowledge and students' achievement motivation in biology?

Table 1: Linear regression analysis of the relationship between students' perception of teachers' pedagogical knowledge and students' achievement motivation in biology

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
Teachers' pedagogical knowledge and students' achievement motivation	.457[a]	.209	.207	6.916

Result on Table 1 shows that the correlation coefficient between students' perception of teachers' pedagogical knowledge and students' achievement motivation in biology was 0.457. The result implies that there exists a positive strong association between students' perception of teachers' pedagogical knowledge and their achievement motivation in biology. The result also revealed that the coefficient of determination (R^2) associated with the correlation coefficient of 0.457 was 0.209. The coefficient of determination (R^2) of 0.209 implies that students' perception of teachers' pedagogical knowledge accounts for up to 20.9% of students' achievement motivation in biology. This is an indication that 79.1% of the variation in students' achievement motivation in biology is attributed to other factors other than their perception of teachers' pedagogical knowledge.

Hypothesis One: There is no significant relationship between students' perception of teachers' pedagogical knowledge and students' achievement motivation in biology.

Table 2: Regression analysis of the significant relationship between students' perception of teachers' pedagogical knowledge and students' achievement motivation in biology

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	4461.261	1	4461.261	93.285	.000[b]
	Residual	16881.922	353	47.824		
	Total	21343.183	354			

The result on Table 2 shows that an F-ratio of 93.285 with associated exact probability value of 0.00 was obtained. This probability value of 0.00 was compared with 0.05 set as level of significance for testing the hypothesis and it was found to be significant since 0.00 is less than 0.05. Thus, the null hypothesis of no significant relationship between students' perception of teachers' pedagogical knowledge and students' achievement motivation in biology was rejected. The researcher therefore, concludes that there is a significant relationship between students' perception of teachers' pedagogical knowledge and students' achievement motivation in biology.

Research Question Two: What is the relationship between students' perception of teachers' personality traits and students' achievement motivation in biology?

Table 3: Linear regression analysis of the relationship between students' perception of teachers' personality traits and students' achievement motivation in biology

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
Teachers' personality traits and students' achievement motivation	.066[a]	.004	.001	7.759

Result on Table 3 shows that the correlation coefficient between students' perception of teachers' personality traits and students' achievement motivation in biology was 0.66. The result implies that there exists a positive very strong association between students' perception of teachers' personality traits and their achievement motivation in biology. The result also revealed that the coefficient of determination (R^2) associated with the correlation coefficient of 0.66 was 0.004. The coefficient of determination (R^2) of 0.004 implies that students' perception of teachers' personality traits accounts for up to 0.4% of students' achievement motivation in biology. This is an indication that 99.6% of the variation in students' achievement motivation in biology is attributed to other factors other than their perception of teachers' personality traits.

Hypothesis two: There is no significant relationship between students' perception of teachers' personality traits and students' achievement motivation in biology.

Table 4: Regression analysis of the significant relationship between students' perception of teachers' personality traits and students' achievement motivation in biology

Model		Sum of Squares	Df	Mean Square	F	Sig.	Decision
1	Regression	91.962	1	91.962	1.528	.217[b]	NS
	Residual	21251.221	353	60.202			
	Total	21343.183	354				

The result on Table 4 shows that an F-ratio of 1.528 with associated exact probability value of 0.217 was obtained. This probability value of 0.217 was compared with 0.05 set as level of significance for testing the hypothesis and it was found to be significant since 0.217 is greater than 0.05. Thus, the null hypothesis of no significant relationship between students' perception of teachers' personality traits and students' achievement motivation in biology was not rejected. The researcher therefore, concludes that there is no significant relationship between students' perception of teachers' personality traits and students' achievement motivation in biology.

Research Question Three: What are the relationships among students' perception of teachers' pedagogical knowledge, personality traits and students' achievement motivation in biology?

Table 5: Linear regression analysis of the relationship among students' perception of teachers' pedagogical knowledge, personality traits and students' achievement motivation in biology

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
Students' perception of teachers' pedagogical knowledge, teachers' personality traits and students' achievement motivation	.460[a]	.212	.207	6.913

Result on Table 5 shows that the correlation coefficient among students' perception of teachers' pedagogical knowledge, personality traits and students' achievement motivation in biology was 0.460. The result implies that there exists a positive strong association among students' perception of teachers' pedagogical knowledge, personality traits and students' achievement motivation in biology. The result also revealed that the coefficient of determination (R^2) associated with the correlation coefficient of 0.460 was 0.212. The coefficient of determination (R^2) of 0.004 implies that students' perception of teachers' pedagogical knowledge and personality traits accounts for up to 21.2% of students' achievement motivation in biology. This is an indication that 78.8% of the variation in students' achievement motivation in biology is attributed to other factors other than their perception of teachers' pedagogical knowledge and personality traits.

Hypothesis three: There is no significant relationship among students' perception of teachers' pedagogical knowledge, personality traits and students' achievement motivation in biology.

Table 6: Regression analysis of the significant relationship among students' perception of teachers' pedagogical knowledge, personality traits and students' achievement motivation in biology

Model		Sum of Squares	Df	Mean Square	F	Sig.	Decision
1	Regression	4519.418	2	2259.709	47.279	.000[b]	S
	Residual	16823.765	352	47.795			
	Total	21343.183	354				

The result on Table 6 shows that an F-ratio of 47.279 with associated exact probability value of 0.000 was obtained. This probability value of 0.000 was compared with 0.05 set as level of significance for testing the hypothesis and it was found to be significant since 0.000 is greater than 0.05. Thus, the null hypothesis of no

significant relationship between students' perception of teachers' pedagogical knowledge, personality traits and students' achievement motivation in biology was rejected. The researcher therefore, concludes that there is a significant relationship between students' perception of teachers' pedagogical knowledge, personality traits and students' achievement motivation in biology.

Discussion of the Findings

The finding of this study showed that the relationship that exists between students' perception of teachers' pedagogical knowledge and their achievement motivation in biology is positive strong association. This means that there is a strong connection between students' perception of teachers' pedagogical knowledge and achievement motivation of those students in biology. Further analysis indicates that there is a significant relationship between students' perception of teachers' pedagogical knowledge and students' achievement motivation in biology. This could be as a result of teachers' use of inappropriate pedagogical approach in teaching some concepts in biology. The finding of this study is in alignment with that of Benson, Nwagbo, Ugwuanyi and Okeke (2020) whose report showed that students' perception of the teachers' pedagogical skills had significant influence on their attitude towards science. Akram (2019) whose report revealed that there is a moderate positive significant relationship between teacher effectiveness score and student achievement s n agreement with this study. That is why Kyriacon (2007) opined that developing a repertoire of pedagogical skill as a teacher will help extend the teachers' knowledge such as when and how to apply the pedagogical skill that will be observable in the classroom. Kyriacou was basing on the assumption that the complex teaching act can be broken down into specific skills that the teacher can develop and easily use effectively in the classroom.

The findings of the study revealed that the relationship between students' perception of teachers' personality traits and students' achievement motivation in biology was positive very strong association. This means that there is a very strong connection between students' perception of their teachers' personality traits and achievement motivation of students in biology. Besides, it was also revealed in the study that there is no significant relationship between students' perception of teachers' personality traits and students' achievement motivation in biology. The finding of this study is in agreement with that of Meyer, Fleckenstein, Retelsdorf, and Köller (2019) who revealed an incremental predictive validity of personality traits for domain-specific academic achievement beyond cognitive ability. Also, Zarabian, Farajollahi, Pour and Seresht, (2015) discovered that there is a meaningful strong relationship between the teachers' personality type and students' achievement motivation. The findings of this study is in-line with that of Zarabian, Farajollahi, Pour and Seresht, (2015).

The findings of the study revealed that the relationship among students' perception of teachers' pedagogical knowledge, personality traits and students' achievement motivation in biology is positive strong association. Also, the findings unveiled that there is a significant relationship among students' perception of teachers' pedagogical knowledge, personality traits and students' achievement motivation in biology. The findings of this study is inconsonance with that of Ude and Akintunde (2020) unveiled that there is a positive significant relationship between personality traits and achievement motivation of students in tertiary institution in Plateau state. Elfrianto (2015) who revealed that there is a significant correlation between achievement motivation and teachers' ability variable is also in agreement with the finding of this study. In the same vein, Thohir, Yuliati, Ahdhianto, Untari, and Yanti, (2021) revealed that the correlation between personality traits and teachers pedagogical and content knowledge (TPACK-Web) was significant. That is why Chua and Jamil (2012) identified that personality traits were the main factors of teachers pedagogical and content knowledge (TPACK).

Conclusion

Based on the findings of the study and the discussion that follows, it is concluded that; the relationship that exists between students' perception of teachers' pedagogical knowledge and their achievement motivation in biology is positive strong association; students' perception of teachers' personality traits has a positive and very strong association on students' achievement motivation in biology; students' perception of teachers' pedagogical knowledge, personality traits also has a positive and very strong association on students' achievement motivation in biology. The relationship between students' perception of teachers' personality traits and students' achievement motivation in biology is not significant. Also, the relationship among students' perception of teachers' pedagogical knowledge, personality traits and students' achievement motivation in biology is significant.

Recommendations

Based on the findings, the researchers made the following recommendations, thus;

1. Federal and state ministries of education and other relevant professional associations interested in the problems of teaching and learning in schools should organize on regular basis seminars/workshops and conferences to highlight the importance of teacher having the required pedagogical knowledge and the right personality traits which would help improve students' achievement motivation especially on

biology.

2. The government should assist schools in the creation of enabling environment capable of enhancing students' academic performance in school.
3. Teachers' pedagogical knowledge test and personality traits questions should be used as one of the criteria for recruiting the services of any teacher n or secondary schools since both variables could influence students' achievement motivation.

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