



Predicting Academic Achievement in Senior Secondary Biology through Teacher Interpersonal Behavior: An Exploration of Educational Reformation and Multiple Intelligence Perspectives

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ABSTRACT

This study investigated the perception of teacher leadership behavior among biology students as a predictor of academic achievement in senior secondary schools in Bauchi State, Nigeria. Two research questions and one hypothesis were addressed in this study, employing a correlational research design to achieve the stated objectives. The study focused on the 2020/2021 academic session, with a population comprising all public senior secondary school students offering biology. The sample, consisting of 404 students, was selected using a multi-stage sampling technique based on Yamane's (1973) formula for sample size determination. Two instruments were utilized for data collection: the Questionnaire on Biology Teacher Interpersonal Behavior (QBTIB) and the Biology Terminal Achievement Test (BTAT). The QBTIB demonstrated high reliability with a Cronbach's Alpha coefficient of 0.88. Data analysis involved mean and standard deviation for addressing research questions, while linear regression analysis was employed to test the hypothesis at a 0.05 level of significance. Results indicated that biology students perceived their teachers as exhibiting a moderate level of leadership behavior. Additionally, students' academic achievement was found to be at a very low level. Importantly, the study revealed that students' perception of teacher leadership did not significantly predict academic achievement (Computed p-value 0.59, $p < 0.05$). In light of these findings, it is recommended that biology teachers enhance their demonstration of leadership behavior in the learning environment to foster positive learning outcomes, among other suggestions.

ARTICLE INFO

Article History

Received: August 2023

Received in revised form: September, 2023

Accepted: October, 2023

Published online: December, 2023

KEYWORDS

Education Reform, Multiple Intelligence, Academic Achievement, Interpersonal Behaviour, Leadership behaviour.

INTRODUCTION

Education is the mechanism for all types of development. This implies that ambition of every society to grow to its desired height is unequivocally entrusted in education. Nigeria at 21st Century indeed needs the kind of education that taps individuals' inner abilities, imbues them with skills and enables them to reach pinnacle of their potentialities (Adebimpe, 2015). Furthermore, the nation, especially in the present

period of economic predicament, truly needs a sort of education that will untie the prevailing miseries that seem to be obstacles to economic and social development (Ezekwesili, 2019). The kind of education that will be instrumental towards attaining the mentioned desires is only possible when it frequently undergoes reformation in terms of policy, standard and legislation (Shu'ara, 2007). By so doing, it will continuously reflecting

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prevailing societal demands, thus the aspired development is rest assured.

Education reform has the idea that considerable and objective change in the policy and standard of education will yield positive outcomes related to innovations in science and technology, food security, poverty alleviation and improved health services among others (Mbachu & Hamilton, 2013). Suffice to say that the economic woe that seems obstacle to economic and social development got root from our education system. Thus, our education vision ardently needs systemic rejig to emancipate citizens from the current uncertainties in almost all facets of endeavor. If this is judiciously done, it is hoped that new policy and all quality indicators will make the new education system more utilitarian (Adamu, 2000). Explicitly, it is the type of education that makes impacts on wealth and well-being of citizens. This can work well only when teacher factor is recognized and valued.

Teachers as reservoir of knowledge, rightly deserve all that it takes in terms of training, retraining and welfare, so that Nigerian education system in particular will be a relevant and productive scheme (Ajani, Govender & Maluleke, 2018). The Federal Republic of Nigeria- FRN (2014) concerning the present teacher condition, emphasizes that "no education system rises above the quality of its teachers," This clause confirms the fundamental role of quality teachers as the life wires of the educational system. In as much as the government fails to prepare them to fit the challenges of the 21st Century, students' academic achievement in all learning results will be crumbling indefinitely (Opoh, Okoh & Ubung, 2014). Consequently, the aspiration of our nation and of course the North Eastern states will continue to stay a mirage and precarious. Hence, the need for teacher-capacity building.

Ensuring teacher-capacity building for teachers to improve students' learning outcomes will be suitable for our geopolitical region, particularly Bauchi State, which experiences serial abysmal students' achievement in biology (Daily Post, 2019). Perhaps, the envisaged capacity building programme will unveil hidden multiple intelligence of individual teachers, so that they will

be retrained in that line with expectation to influence and improve students achievement. Multiple intelligence is a learning theory propounded by Harvard University professor of Psychology Howard Gardner in 1983. Precisely, the theory posits that each person possesses different ways of learning, as well as intelligence they use in daily affairs (Gardner in Herndon, 2018). For example, some students learn faster when taught through semantics, whereas other are better up when guided through mathematical approaches. Furthermore, the theory enunciates that each student, for instance, has each of the ensuing intelligence to an extent, but there are dominant ones. Explicitly, it suggests human intelligence as an embodiment of cognitive wisdom, which include but not limited to visual-spatial, verbal-linguistic, musical rhythmic, logical-mathematical, interpersonal, intrapersonal, naturalistic and indeed body-kinetic intelligence.

From the preceding section, one can contends that teachers should employ variety of teaching methods to teach concepts in learning environment for the simple reason that students learn based on their dominant multiple intelligence (Morgan in Herndon, 2018). In the light of this, it is palpable that in spite of other factors that necessitate curriculum reform, there is serious need to imbed concept of multiple intelligence, particularly in biology curriculum, which should reflect on contents, methodologies and teaching materials. Evidently, Bas and Beyhan in Herndon (2018) affirm that multiple intelligence-based learning is more effective in terms of students' academic achievement and attitude. Perhaps, according to Herndon (2018) North American states restructured their curriculum and populate it with multiple intelligence methodologies because of the empirical reports garnered, which confirmed dynamism of the strategy on academic achievement.

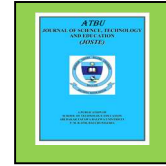
Several studies have indicated classroom teachers, specifically biology tutors most often employ conventional lecture method as the only technique for guiding students to attain to stated objectives (Fatoba, 2015). Consequently, the perennial achievement in the subject turns up too disgusting and embarrassing (Bichi, Ibrahim &

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Ibrahim, 2019), as well as obstacles to developmental plans of the North Eastern states, unequivocally the Bauchi State (Daily Post, 2019). Bauchi State in recent times suffers serious setback in students' achievement in Biology. Despite the fact that the state invests a lot of funds in the supply of teaching materials, renovation and capacity building for teacher, but all to no avail. The state has it in its development plan, the need to have enough workforce in medical, paramedical, biotechnology, pharmacy and agriculture among others (Daily Post, 2019). To study each of these disciplines in higher institutions of learning, a candidate must obtain at least a credit pass in biology, as well as in other required subjects. Over the years, the worst thing still keeps on repeating itself. In view of this excruciating situation, education stakeholders in the state frowned specifically at the negative students' perception of teacher interpersonal behaviour as cause of the menace. Teacher interpersonal behaviour is been described as a set of communication behaviour (verbal and non-verbal) displayed by a teacher in a learning environment that have bearing on students' learning results. The teacher interpersonal behaviour according to Zhan and Isma'il (2021) include leadership, helping, understanding and students' responsibility. Others are uncertain, dissatisfied, admonishing and strict behaviour. In the same dimension, the stakeholders furthermore established their reason for the accusation on interrogative statement as "why students perform excellently with one teacher and fail to do so with another?" This justifies the role of teacher interpersonal skills on students' learning results.

In the light of the foregone discourse, it comes to be pertinent upon biology teachers in the state to begin displaying interpersonal skills, especially the leadership in learning environment for the improvement of cognitive and affective outcomes. To comprehend the concept explicitly, Nasiran and Biswan (2022); Oqvist & Malmstrom (2017) described teacher leadership behaviour as a teacher's disposition to lead in all classroom activities, including enacting rules and all courses of action. Also, it is characterized by the teacher's expression of a strong desire to achieve adequate

teaching and learning goals. Moreover, Foth and Horvath (2022); Ehigbor (2017) conducted independent empirical studies and found the presence of a positive and statistically significant relationship between teacher leadership quality and academic achievement. To ascertain whether the mentioned suggestion will have positive effect on students' achievement in biology, the following questions need to be answered: firstly, "do biology teachers in Bauchi State display leadership behaviour that enhances students' cognitive and affective outcomes in the subject? Secondly, does biology students' perception of teacher leadership behaviour predict and influence their learning outcomes in the subject? These probing statements, in essence, put down the problem on which this study examined whether biology students' perception of teacher leadership behaviour will predict their academic achievement in senior secondary schools in Bauchi State, Nigeria.

METHODOLOGY

The research design for this study was correlational. The correlational research design enables researchers to observe an association between two or more variables to establish a statistically corresponding relationship between them, without the researcher necessarily controlling one of them (Kabir, 2016). This study was conducted in Bauchi State, Nigeria. The population of this study comprised all the public senior secondary school students offering biology in the 2020/2021 academic session in Bauchi State. Multi-stage sampling technique was used in selecting the sample of 404 students from the population. The sample size (404) was determined through the application of the Taro Yamane (1973) formula with a 95% confidence interval. Two instruments were used for data collection in this study. The instruments included the Questionnaire on Biology Teacher Interpersonal Behaviour (QBTIB) and Biology Terminal Achievement Data (BTAT). Reliability coefficients 0.88 of the QBTIB was determined using Cronbach Alpha. The data collected from the field study were subjected to preliminary tests of linearity, normality and homoscedasticity. The

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result of these tests justified the use of mean and standard deviation to answer the research questions. Also, linear regression was used in testing the H_{01} . The decision rule for testing a null hypothesis in this study was $p < 0.05$.

Research Questions

1. What is the level of teacher leadership behaviour in senior secondary schools in Bauchi State?
2. What is the level of biology students' achievement in senior secondary schools of Bauchi State?

Hypothesis:

H_{01} : Teacher leadership behaviour will not significantly predict biology students' academic achievement in senior secondary schools in Bauchi State.

Data Analysis:

The research questions formulated were analyzed using descriptive statistics, while the only null hypothesis was tested using linear regression tested at 0.05 level of significance

Table 1: Mean and Standard Deviation of Level of Teacher Leadership Behaviour as Responded by Biology Students in Senior Secondary Schools of Bauchi State.

S/N	Description	Mean	SD	Decision
1	At what level does your biology teacher explain concepts confidently?	4.21	1.03	HL
2	At what level does your biology teacher notice all that goes on in the classroom?	3.79	1.05	ML
3	At what level does your biology teacher interact in a controlled manner?	3.79	1.20	ML
4	At what level does your biology teacher hold your attention collectively?	3.87	1.14	ML
5	At what level does your biology teacher lead in all learning activities?	3.80	1.19	ML
6	At what level does your biology teacher invite your comments?	3.65	1.27	ML
Grand Mean		3.85	1.14	ML

SD: Standard Deviation. **Dec:** Decision.

The result of the analysis presented in Table 1 shows the level of teacher leadership behaviour as answered by students in senior secondary schools in Bauchi State. Despite the fact that the mean values for the statements describing leadership behaviour range from 3.65

to 3.87, yet, they portray encouraging behavioural expression by the biology teachers. Additionally, the grand mean of 3.85 indicates a moderate level of demonstrating leadership behaviour by teachers in biology classrooms in senior secondary schools in Bauchi State.

Table 2: Mean and Standard Deviation of the Level of Biology Students' Achievement in Senior Secondary Schools of Bauchi State.

S/N	Mean	Standard Deviation	Decision
1.	53	10.54	VLL

Table 2 presents the mean and standard deviation values of students' academic achievement in senior secondary school biology in Bauchi State. The mean score of 53 implies that the students' achievement is perceived to be at a

very low level. This outcome could be attributed to the level at which the biology teacher expresses leadership behaviour. From the preceding tables, it is obvious that the existing students' achievement is linked to the inability of teachers to

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demonstrate leadership behaviour at a very high level. In other words, none of the scores in the earlier tables is up to a high level (4), let alone reaches a very high level (5).

Testing Hypotheses

The following null hypothesis was formulated and tested at a 0.05 level of significance in this study:

Ho₁: Teacher leadership behaviour will not significantly predict students' academic achievement in senior secondary schools in Bauchi State.

Table 3: Regression Analysis of Teacher Leadership Behaviour as Predictor of Students' Academic Achievement in Senior Secondary Schools in Bauchi State.

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	32.427	1	32.427	.291	.590 ^b
	Residual	46236.796	415	111.414		
	Total	46269.223	416			

$P < 0.05$

Table 2 indicates how well the regression equation fits the data. The table indicates that the regression model did not predict the criterion variable (academic achievement) statistically. This implies that students' perception of teacher leadership behaviour did not positively

and significantly correlate with their academic achievement in biology classrooms [F (1, 415) = 0.291, P = 0.590]. Also, it is observed that the regression model is not a good fit for the data, consequently, the null hypothesis (H₀₁) is not rejected absolutely.

Table 4: Model Summary of Teacher Leadership Behaviour as Predictor of Students' Academic Achievement in Senior Secondary Schools in Bauchi State.

Model	R	R Square	Adjusted R Square	Std. error of the Estimate
1	.026 ^a	.001	-.002	10.55528

$P < 0.05$

Table 3 presents the required information to predict students' academic achievement from their perception of teacher leadership behaviour, in addition, to determining whether academic achievement significantly contributes to the model. The relative contribution of students' perception of teacher leadership behaviour is shown by the R and R² values. The R² suggests that only 0.2% of the variance in academic achievement in biology was explained by their perception of teacher leadership behaviour. This confirms that the overall fit of the model is not favourable.

Bauchi State (Computed p -value 0.59, $p < 0.05$).

DISCUSSION

Finding of the research question one expresses that biology students perceived their teacher displaying leadership behaviour at a moderate level during classroom interactions. This implies that the teacher leads students in making sure that the stated objectives are considerably achieved. This conclusion is supported by Ehigbor (2017) who found teacher leadership behaviour as the most sprouting attribute among interpersonal behaviour. Similarly, Gedamu and Shures (2015); Fan's (2012) inferences put weight behind this outcome that leadership behaviour is among the most striking teacher attributes that influence learning outcomes. On the contrary view, Pratiwi

FINDING OF THIS STUDY

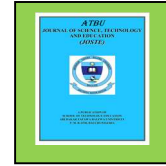
1. Biology students' perception of teacher leadership behaviour did not significantly predict their academic achievement in

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(2019); den Brok, Brekemens and Wubbels (2004) in similar but independent studies found that the level of students' perception of leadership behaviour was inadequate to make a difference. Demonstration of leadership behaviour in the learning environment in the view of Telli *et al.* (2007) is an effort that is expected from progressive teachers, however it should not be extended to a level of authoritarianism.

Although the level of students' perception of teacher leadership was moderate (3.85), the result of linear regression analysis indicates a shortfall of the sub-scale in the prediction of students' academic achievement. This is very obvious since the computed p -value (0.59) is above $p < 0.05$. The outcome is in line with Pratiwi, (2019); Larry, (2017); Wei. den Brok & Zhou, (2009) report, submit that teacher leadership behaviour does not relate to students' achievement in the learning environment. Equally, this finding is in defiance of the view of Ferdinand and Lucas (2020); Xu and Qi (2019); Charalampous & Kakkinos (2017) who verified the existence of a positive relationship between the predictor (leadership) and criterion (academic achievement) variables. Similarly, Jailani and Abdullahi (2019) validate the assertion that leadership behaviour predicts students' academic achievement. Unfortunately, the outcome of this relation is a paradox of the reality in earlier studies. Perhaps to meet what was reported in the former studies, biology teachers in Bauchi State need to raise the level of displaying leadership behaviour by demonstrating more leadership skills in the classroom for accomplishing sufficient achievement in the subject.

CONCLUSION

Based on the findings from the analysis of data, it was concluded that students' perception of teacher interpersonal behaviour is not a predictor of their academic achievement.

RECOMMENDATIONS

1. School administrators should ensure that biology teachers express a higher level of leadership behaviour in the learning

environment towards the attainment of higher learning outcomes.

2. School principals should organize in-house training on the demonstration and importance of leadership behaviour in enhancing academic achievement.
3. Ministry of education in alliance with teacher resource centres should organize seminars and conferences on methods of using leadership behaviour in every classroom activities.
4. Government should as a matter of necessity enact a law that only teachers found high in expressing leadership behaviour will be considered for promotion to the next teaching rank.
5. The inspectorate division of the Ministry of Education should adopt the use of QBTIB as an instrument for monitoring, specifically the level of displaying leadership behaviour in a learning environment.

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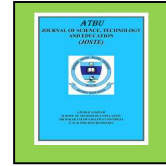
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