

Research Article

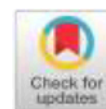
The correlation between learning styles and biology learning performance of Nigerian students

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ABSTRACT

Learning style has been considered as one of determining factors for learning processes. This study aimed at observing the correlation between students' learning style and performance of Nigerian students in biology. The sample of this study consisted of 100 students which were randomly selected from the secondary schools in Ifelodun LGA, Kwara State, Nigeria. The two validated instrument used for data collection were Grasha & Reichmann's Student Learning Scale and VAK/VARK Learning Style. The data gained were analyzed using percentage, Pearson correlation, and Chi-Square test. The study findings indicated that: (i) there was a negative correlation between students' academic performance and visual (0.061) and kinesthetic learning style (0.50), as well as positive correlation between the performance and auditory learning style (0.108). (ii) There were no significant differences between the study of learning styles, either visual ($t(99) = 1.60, p = 0.11$), auditory ($t(99) = 1.33, p = 0.18$), or kinesthetic ($t(99) = 0.59, p = 0.55$), of male and female biology students' performance. Thus, it is suggested that teachers choose the most proper learning methods which accommodate the students' need based on their learning styles.



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INTRODUCTION

Science is an organised body of knowledge in form of concepts, laws, theories and generalisations'. It is the study of nature and natural phenomena in order to discover their principles and laws (Omorogbe & Ewansiha, 2013). Science is a multidisciplinary human activity which involves a planned systematic investigation and understanding of the world, nature and the universe. This activity culminates into testable falsifiable and verifiable body of knowledge. It is a dynamic enterprise that primarily is a quest for knowledge, though not the knowledge itself. Science can be regarded as agent of development which plays an important role in bringing about these changes through technological advancement, national wealth enhancement, health improvement and industrialization.

Biology is one of the important science subjects taught in senior secondary schools (Michael, 2012), colleges and universities (Steigerwald, 2019). Biology provides basic knowledge and understanding of principles whose application contributes greatly to the quality of life as such, it stands in a central position among the science. Biology is one of the basic science subjects that play a fundamental role in economic development of a country. Biology is basically the study of life. It is the study of the living things in our world which are comprised of both plant and animal. Biology is an integral part of the science curriculum both at the senior secondary as well as university. As one of important science subjects which enables learners to encompass more about the world, there is a need to provide effective learning activities for learners. This, in turn, will lead to the attainment of scientific and technological greatness (Adesoji & Olatunbosun, 2008). In addition with the effectiveness of learning activities, teacher is the key point which determines the achievement of learning goals. Therefore, it is very important to recognize the personality of biology teachers who are trained to demonstrate, expand, and deliver biology contents to learners.

Learning style can be described as a set of factors, behaviours and attitudes that facilitate learning for an individual in a given situation. It is also called as meta-strategy (Klement, 2014) of learners to perceive and process information (Omar, Mohamad, & Paimin, 2015) in learning situations. Learning style is the characteristic of cognitive, affective, social (Alfonseca, Carro, Martin, Ortigosa, & Paredes, 2006) and physiological behaviours that are served as relatively stable indicators of how learners perceive, interact with, and respond to the learning environment. Learning style can be defined, classified and identified in many different ways.

Several previous studies reported that there were learning styles determined students' achievement. Omar, Mohamad, and Paimin (2015) reported that there were no significant difference of electrical engineering students' achievement based on their learning styles. Likewise, Salter, Evans, and Forney (2006) stated the same conclusion of administration affair program students' performance. Alfonseca, Carro, Martin, Ortigosa, and Paredes (2006) argued that learning styles affected the quality of computer science students' work. However, the studies focused in the effect of learning styles of students' performance in biology subjects, particularly in Nigeria, are very limited.

The essential information provided by this study will benefit scientific field in enriching evidences about variables responsible for students' performance as considerable as providing idea for educators in planning their learning processes, particularly in Biology subject. Hence, the purpose of the study was to investigate the effect of students' learning styles on their performance in Biology of Senior Secondary School Ifelodun LGA Kwara State, Nigeria. Furthermore, it also exhibited the correlation between the students' learning styles and their performance in biology as well as to emphasize students' learning style preference based on their gender as the moderating variable.

METHOD

This descriptive survey research was carried out in Senior Secondary School in Ifelodun Kwara State, Nigeria. The population included biology students in all secondary schools located in Ifelodun Kwara State, Nigeria. The target population for this study was Biology (II) students. It involved four secondary schools in Ifelodun Kwara State which were selected from the 164 other schools. The total numbers of 100 biology students were employed in the study. The 100 male and female students were selected using simple random sampling technique and the students' learning styles was determined. The variables tested in this study were: students' learning styles, gender and their influences on biology students' performance in senior secondary school.

The procedure for data collection comprised of several steps: 1) the researchers visited each of the selected schools for sampling; 2) the researchers sought permission from the school principal or administrator with letter of introduction from the researcher's Head of Department of Science Education University of Ilorin to show the originality of the research; 3) the researches explained the study purpose to the respondents (students); 4) The researchers administered the questionnaire in each school and collect them back immediately after being completed. The instruments used for data collection in the sampled schools were Grasha and Reichmann's students learning scale and VAK/VARK Learning Style.

The data analysis technique involved was descriptive and inferential statistics. Furthermore, the research questions were answered using percentages. Meanwhile, the hypotheses were tested using parametric statistics of Pearson Correlation and independent samples t-test.

RESULTS AND DISCUSSION

The biology students in Senior Secondary School in Ifelodun LGA Kwara State, Nigeria performed several learning styles. The research results related to the learning styles chosen by students are served in [Table 1](#). Based on the table, it can be clearly seen that the majority of the respondents were visual learners (64.0%), while remain respondents were auditory (22.0%) and kinaesthetic (16.0%). Majority of the respondents are visual learners.

Table 1. The prevalent learning styles performed by biology secondary school students

Learning styles	Percentages (%)
Visual	64.0
Auditory	22.0
Kinesthetic	16.0
Total	100

The majority of Nigerian senior secondary students tended to choose visual as their learning style. This was also witnessed by economics education students in Indonesia ([Syofyan & Siwi, 2018](#)), computer science students in Spain ([Alfonseca et al., 2006](#)), as well as medical school students in Barbados, West Indies ([Ojeh, Sobers-Grannum, Gaur, Udupa, & Majumder, 2017](#)). Students with visual learning style attained their comprehension from the information they gained from visual resources such as pictures, graphs, diagrams, and so forth ([Hawk & Shah, 2007](#)). This fact can be possibly caused by the previous conditions which led the students to be accustomed with visual learning activities such as describing pictures, drawing structures, and so on. Thus, it was not surprising observation result if visual was the most voted learning style chosen by students.

In accordance with the learning styles found among Nigerian secondary students (i.e. visual, auditory, and kinaesthetic), the further question which is interesting to discuss is the relationship between students' learning style and their performance in biology. The data analysis results gained in this study to reveal the answer of that question are showed in [Table 2](#). Based on [Table 2](#), it can be seen that there was a negative correlation between students' visual learning styles and their academic performance (0.061), likewise with the kinaesthetic (0.50). Contrarily, the positive correlation occurred between students' academic performance and auditory learning style (0.108). Yet, none of the correlations were significant.

Table 2. Pearson correlation on the relationship between students' learning styles and their performance in biology

		Students performance	Visual	Auditory	Kinesthetic
Students performance	Cal-r	1	-0.061	0.108	-0.50
	Sig.		0.44	0.172	0.525
	N	100	100	100	100
Visual	Cal-r	-0.061	1	-0.715	-0.489
	Sig.	0.441		0.00	0.00
	N	100	100	100	100
Auditory	Cal-r	0.108	-0.715	1	-0.260
	Sig.	0.172	0.00		0.01
	N	100	100	100	100
Kinesthetic	Cal-r	-0.050	-0.489	-0.26	1
	Sig.	0.525	0.00	0.01	
	N	100	100	100	100

The findings of this research strengthen the evidences revealed by ([Omar et al., 2015](#)) which proved that there were no significant difference of students achievement as the various learning styles they possessed. Hence, [Rogowsky, Calhoun, and Tallal \(2020\)](#) stated clearly that that providing instruction based on students' learning styles does not improve their learning achievement. Learning-styles based instructional also was criticized by [Papadatou-Pastou, Gritzali, and Barrable \(2018\)](#) as the unreliable-evidenced concept in determining instructional processes. They argued that the identification of learning styles can be the hit and miss process as there is no agreement between the students' and teachers' assessments. Moreover, [Ojeh et al \(2017\)](#) proved that there was a significant difference between students' interpretation about their learning style and their actual conditions. In the other words, there are many other variables which possibly interfere students' performance besides learning styles.

The fact that there were no significant difference of students' performance based on their learning styles become more interesting to be discussed as there are many research findings which proved the opposite results. [Buch and Bartley \(2002\)](#) have claimed that learning style is a considerable component for educators to

determine the method they plan to use to deliver the materials to their learners. By considering the essential effect emerged by learning styles, there were even some serious attempts to develop learning style instrument to enhance students' achievement. There are at least six well known instruments among researchers to assess learning styles, namely, Kolb, Gregorc, Felder–Silverman, Fleming, and Dunn and Dunn as well as the Entwistle and Tait Revised Approaches (Hawk & Shah, 2007). For further consequences, there are many researchers suggested to consider learning styles in determining the instructional processes they conduct (Alfonseca et al., 2006; Ojeh et al., 2017; Syofyan & Siwi, 2018).

To dig more feature about learning styles, this study conducted the analysis on students' learning styles based on their gender. The results of the analysis are served in Table 3. The table obviously shows that there were no significant differences of learning styles chosen by male and female students, either visual ($t(99) = 1.60, p = 0.11$), auditory ($t(99) = 1.33, p = 0.18$), or kinaesthetic ($t(99) = 0.59, p = 0.55$) learning styles.

Table 3. The analysis results of independent samples t-test of the difference learning styles chosen by male and female biology students in Ifelodun, LGA Kwara State

Learning style	Gender	Mean	SD	t-cal	t-crit	df	Sig.	Decision
Visual	Male	6.851	2.05	1.60	0.733	99	0.112	NS
	Female	6.28	2.32					
Auditory	Male	4.44	1.97	1.33	0.405	99	0.185	NS
	Female	4.86	1.96					
Kinesthetic	Male	2.7	1.62	0.59	0.603	99	0.553	NS
	Female	2.85	1.52					

By considering the insignificant difference between the both genders, yet, to be more detail, visual learning style tended to be chosen by male students ($M = 6.85, SD = 2.05$) compared to the female ($M = 6.28, SD = 2.32$). In contrast, the other two learning styles were highly voted by female students (Auditory [$M = 54.86, SD = 1.96$], Kinesthetic [$M = 2.85, SD = 2.85$]) than the male (Auditory [$M = 4.44, SD = 1.97$], Kinaesthetic [$M = 2.70, SD = 1.62$]).

This findings are in agreement with Klement (2014) and Ojeh et al (2017) who said that the students' preference are about similar between male and female students. Albeit that it is well known that there are also proven differences between male and females in many aspects (Meyers-Levy & Loken, 2015) even in education field (Kumari & Saraladevi, 2014; van der Vleuten, Jaspers, Maas, & van der Lippe, 2016), there are also many similarities proven exist between them including their choices in major study (Reddy, 2017), work field (Alon & Diprete, 2015), attitude toward science (Eren, Bayrak, & Benzer, 2015; Yamtinah, Masykuri, & Syahidul Shidiq, 2017), and skills (Saido, Siraj, Nordin, & Amedy, 2015; Sweeney & Costello, 2009; Veloo, Perumal, & Vikneswary, 2013).

The absent of significant differences in students' preference in learning styles based on their gender difference is making sense. There are several factors identified responsible in determining gender inequity in their choices (i.e. sex, parental, peer influences, social and cultural stereotyping) (Osagie & Alutu, 2016). Thus, the phenomenon of gender equity can be naturally occurred as the proper treatment given by their surroundings to the both genders as well as their needs are well accommodated (Reddy, 2017).

CONCLUSION

The present study reveals a negative correlation between students' visual learning styles and their academic performance, likewise with the kinaesthetic. Perversely, a positive correlation was found between students' academic performance and auditory learning style. Even though none were significant. It is also concluded that there were no considerable effect of learning styles; neither visual, auditory, nor kinaesthetic; toward students' performances in biology. Similarly, there were no essential difference of students' learning style preferences based on gender view.

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