STUDENTS' LEARNING STYLES AND BASIC SCIENCE LEARNING OUTCOMES IN SECONDARY SCHOOLS IN BENIN METROPOLIS

[1]ORHERUATA, M. U. & [2]ATUMA, U.
[1&2]Department of Educational Evaluation and Counselling Psychology, University of Benin, Benin city.
mati.orheruata@uniben.edu,ufuoma.akpotu@uniben.edu

Abstract
The study investigated students' of learning styles and Basic Science learning outcomes in secondary schools in Benin Metropolis. Specifically, to determine the relationship and the relative contributions of the learning styles: kinesthetic learning style, visual learning style and reading learning style to the students' academic performance in Basic Science. Four hypotheses were formulated and tested to guide the study. The study adopted the survey research design of the correlational approach. The population of the study was made up of forty- seven public secondary schools in Benin Metropolis with a total population of six thousand nine hundred and twenty (6,920) students in Junior Secondary School Two (JSS2). A sample size of four hundred and fifty (450) students selected from fourteen public secondary schools using the proportionate stratified and simple random sampling techniques. The research instrument used were Questionnaire and score collection proforma.The Crombach Alpha method was used to establish the reliability, given reliability coefficient of 0.73, 0.76 and 0.70were obtained for kinesthetic, visual and reading learning styles subscale respectively. The data collected were analyzed using Pearson Product Correlation Moment and Linear Regression Analysis and tested at 0.05 Alpha level of significance. Findings from the study revealed that the students' perception of kinesthetic and visual learning styles significantly influenced Basic Science learning outcome. Also, the findings revealed that the kinesthetic and visual learning style contributed mainly to the Basic Science learning outcome with visual learning style as the highest contributor. Based on this, it was recommended that teachers of Basic Science should accept that students differ in learning styles and use that knowledge to better facilitate learning.

Keywords: Perception,Teaching styles, Basic Science and Learning outcomes

Introduction

Basic Science is an important science subject in upper basic school from where the young Nigerians are expected to upgrade their capability in Science Education prior to the senior secondary school. Basic Science expresses the fundamental unity of scientific thought towards the actualization of science and technological advancement of the nation. It is a subject that is crucial for the development of the nation as a foundation for science and technology. It is expected

that by learning Basic Science at the basic education level, every Nigerian student will be given the basic knowledge and understanding of what science is all about and some innovations around it. The Nigeria education system has it that after a course of instruction or end of a programme, there should be a change in behavior of the students which should be reflected in their academic performance (Federal Republic of Nigeria, FRN, 2016). However, the expectation on the performance of students in Basic Science especially at the Basic education certificate examination (BEDC) is not encouraging and has become a disturbing trend that bothers education stakeholders. Orheruata, Lotobi and Gobaye (2017) reported that the persistent poor performance of students in examinations in Nigeria has made the development of science education a difficult task. Attempt to find solution to the poor performance of students has made researchers in science education to consider a number of factorsthat could influence academic performance. One of such factors is learning styles in terms of accomplishing the learning task in the classroom. Bosman and Schulze (2018)pointed attention to lack of awareness of learning styles by the students as a factor attributing to the cause of students' poor achievement.

An individual is constantly interacting with and influenced by the environment. This experience makes him change or modify his behaviour to deal effectively with it. In other to gain more knowledge on how human being does this, the concept of learning needs to be understood. Learning is stated as the skills, knowledge, habits, attitude, interest, and other personality characteristics that are changed or modified as a result of previous experience (Ilogu, 2012). It is defined as any relatively permanent change in behaviour resulting from practice and experience. Understanding the essentials of how pupils learn to develop a conducive learning environment in which they can successfully learn the desired objectives is crucial. Developing a conducive learning environment requires interactions; that is, teachers must be aware of the students' differences or factors such as their previous knowledge, rate of learning, general learning capabilities, and learning styles. The knowledge of this will help the teachers to plan and give the deserving pupils the necessary individual attention. Every learner develops the motivation to learn, the willingness to learn and embrace both the methods and the materials of learning. The teachermust ensures that the learners' communications is the subject matter and the associated learning process. If the child must consciously learn how to process information, ideas, and subject matter, then his learning style must be critically considered in the learning process (Afolabi, 2022).

The definitions of learning styles from literatureare rich and encompassing.Sadeghi et al. (2012) defined learning style as students' individual preferences, needs for learning conditions, or modes of learning. Also, learning styles as defined by Dissanayaka (2014) is the students' approach to thinking and problem-solving. To this end, the term learning style, cognitive style, thinking style, and problem-solving style are often used interchangeably. Similarly, Flemming (2015), learning style is defined as perception, thought, remembering, or problem-solving of the individual in the way that he or she is used to in carrying out activities

.Pashler et al. (2008) add that because students learn information in different ways, it is necessary to identify what is most likely to trigger their concentration. Therefore, for this study, after considering different definitions, learning style can be described as the personal approach that an individual student uses when concentrating on the process, internalizing, problem-solving, retaining, and recalling new and difficult information. It is assumed that these definitions include cognitive processes, and the individuals use the learning style that they are used to.

There are numerous styles in learning but the most perceptible learning styles as identified by Seif(2006) include auditory, kinesthetic, visual, reading and writing learning styles. Within the context of this study, the kinesthetic, visual and reading learning styles are considered. Kinesthetic learning is a learning style in which learning takes place by the students as they carry out physical activities rather than listening to a lecture or watching demonstrations. The kinesthetic learners prefer experience and practical demonstrations of the teaching-learning process to acquire information. Kinesthetic learners require whole-body movement to process new and difficult information such as carrying our laboratory experiment, outfield display, display of skills, and manipulation of hands by the teacher, among others. They excel easily with the aid of instructional materials or in concrete learning such as coaching, drilling, practical demonstration among others.

Visual Learning Style is the learning by seeing. It is a style in which a learner utilizes graphs, charts, maps, and diagrams. It varies across those who prefer being given learning instructions with text as opposed to those who prefer being instructed with graphs. Visual learners think in pictures and learn best in visual images. They depend on the instructor's or facilitator's non-verbal cues such as body language to help with understanding. Sometimes, visual learners favour sitting in front of the classroom. They also take descriptive notes of other materials being presented (Ktepi, 2016; VARK learn, 2016).This group of learners needs to see information to learn it, and this 'seeing' takes many forms, from spatial awareness, photographic memory, colour, brightness, contrast, and other visual information. In using this style, learners with preference tend to enjoy learning when video and still images are incorporated. Reading learning style involves reading the content by the learner before any form of learning could occur. The teacher could have demonstrated the teaching in a particular way, but not until learner with reading learning style takes the book and readshe/she might not comprehend what the teacher has taught. Learners with reading learning style normally enjoy reading in their free time, can articulate themselves better after reading, and do remember what is learnt through reading. They can translate visual aids such as charts and diagrams into words (Matawal, 2013).

In reading learning style, learners prefer to learn from printed textual learning materials. They tend to use lists, headings, dictionaries, glossaries, definitions, handouts, textbooks, and lecture notes during taking in and giving out information or ideas (Fleming, 2015). A learner with reading learning style prefer reading. Such learners though may not be present during the teaching process, the fact that they can

read whatever that is being taught makes it easy for them to comprehend the content. Also, no matter how long they stay in the learning process, if they are unable to write, jot or note the main fact, it still looks as if they have not learnt unless they read over and over again (Jalbani, 2014).

The knowledge of the personal discovery of the learning styles by the learners themselves in the teaching-learning environment is important. Laying credence to the fact that whichever learning styles students prefer, understanding their preferences in the way they acquire information may be valuable to perform effectively in the classroom. The perception of students of their learning styles is sine qua non to the understanding their preferences. According to Oxford advanced learners dictionary (Hornsby, 2014), the term perception refers to the way in which something is regarded, understood, or interpreted. In line with this meaning, student's perception means the way a student believes or understands the styles of learning Basic Science.

Students may have varied views of learning styles, these variations in perception may account for the learning differences among students. Understanding students' perception of learning styles is important to the success of the teaching and learning process. When learners are educated according to their abilities, interests, desires or suitable methods, there are tendencies that they would have positive dispositions to learn more and may attain success. Conversely, Basic Science is critical to the foundation of science and technological development and as an important subject in modern society. It is a subject that express the fundamental unity of scientific thought whether in school or outside school and therefore becomes crucial that students should have the knowledge of the subject. However, due to the poor performance in this core subject in external examinations, the need to examine the academic performance based on the perceptions of students' learning styles becomes necessary in order to determine if perception of students' learning styles have any significant relationship on students' performance. Again, students react differently to different learning styles and their conscious understanding of the learning styles is critical to their preferences. Whichever learning styles students prefer, understanding their preferences in the way they acquire information may be valuable to perform effectively in the classroom. Critical to the preferences is the importance of their perception. This implies that students' perception of learning styles is an important element to be considered in a bid to improve the learning process.

Furthermore, learning style is not a single entity and a number of researches have been undertaken to demonstrate its effects or influence on academic performance majorly at tertiary institutions (Alumran, 2008; Bosman & Schulze, 2018; Altun & Serin, 2019). However, these researches examining the learning styles are quite exhaustive even though controversy still exists among scholars as to what learning style contribute singly or in combination to students' academic performance. Therefore, this study investigated students' learning styles and basic science learning outcomes in secondary schools in Benin Metropolis of Edo State.

Research Hypotheses

1. Students' kinesthetic learning styles does not significantly relate to Basic Science learning outcomes in secondary schools.
2. Students'visual learning styles does not significantly relate to Basic Science learning outcomes in secondary schools.
3. Students'reading learning styles does not significantly relate to Basic Science learning outcomes in secondary schools.
4. Students' learning styles (kinesthetic, visual & reading) does not significantly predict Basic Science learning outcomes in secondary schools.

Methodology

A survey research design of the correlational approach was employed for the study. The design is considered to be appropriate for this study because it seeks to find the relationship between perception of students learning styles and their academic achievement in Basic Science. The population of the study was 6,920 students which consisted all JS 2 students from 47 public Junior Secondary Schools in Benin Metropolis of Edo State.A sample of 450 students were selected from 14 public Junior Secondary Schools.The sample was selected using the proportionate stratified and simple random sampling procedures. The research instruments used were a Questionnaire titled Kinesthetic, Visual & Reading (KVR) learning styles inventory adapted from Flemming (2015) and a proforma which was used to collect documented Basic Science scores of the sampled students from their teachers. The instruments were content and face validated by experts while the Crombach Alpha method was used to establish the reliability, given reliability coefficient of 0.73, 0.76 and 0.70for kinesthetic, visual and reading learning styles subscale respectively. The data collected were analyzed using Pearson product moment correlation and Linear regression analysis to test the hypothesis at 0.05 Alpha level of significance. To enable comparability of the scores from the different schools, the scores were transformed into standard scores using Z and T score.

Results

Table 1: Correlation of Kinesthetic Learning Style and Basic Science Learning Outcomes

Variables	N	r	Sig (2 tailed)
Kinesthetic Learning Style	450	0.627	0.000
Learning Outcome	450		

P > 0.05

Table 1 above shows that the correlation coefficient between kinesthetic learning style and Basic Science learning outcomes is 0.627 with a p-value of 0.000. Testing at an alpha level of 0.05, the p-value is less than the alpha level of significance ($p<0.05$) and as such the null hypothesis which states that "Students' kinesthetic

learning styles does not significantly relate to Basic Science learning outcomes in secondary schools." is reject. This implies that there is a significant relationship between kinesthetic learning style and Basic Science learning outcomes in public junior secondary schools in Benin Metropolis of Edo State.

Table 2: Correlation of Visual Learning Style and Basic Science Learning Outcomes

Variables	**N**	**r**	**Sig (2 tailed)**
Visual Learning Style	450		
		0.066	0.036
Learning Outcome	450		

P > 0.05

Table 2 above shows that the correlation coefficient between kinesthetic learning style and Basic Science learning outcomes is 0.066 with a p-value of 0.036. Testing at an alpha level of 0.05, the p-value is less than the alpha level of significance ($p<0.05$) and as such the null hypothesis which states that "Students' visual learning styles does not significantly relate to Basic Science learning outcomes in secondary schools." is reject. This implies that there is a significant relationship between visual learning style and Basic Science learning outcomes in public junior secondary schools in Benin Metropolis of Edo State.

Table 3: Correlation of Students' Reading Learning Style and Basic Science Learning Outcomes

Variables	**N**	**r**	**Sig (2 tailed)**
Reading Learning Style	450		
		0.231	0.142
Learning Outcome	450		

P > 0.05

Table 3 above shows that the correlation coefficient between reading learning style and Basic Science learning outcomes is 0.231 with a p-value of 0.142. Testing at an alpha level of 0.05, the p-value is greater than the alpha level of significance ($p>0.05$) and as such the null hypothesis which states that "Students' reading learning styles does not significantly relate to Basic Science learning outcomes in secondary schools." is retained. This implies that there is no significant relationship between reading learning style and Basic Science learning outcomes in public junior secondary schools in Benin Metropolis of Edo State.

Table 4: Linear Regression Analysis of Kinesthetic, Visual & Reading Learning Styles on Basic Science Learning Outcome

	Sum of Squares	df	Mean Square	F	Sig.
Regression	1763.889	2	881.944	11.25	0.00
Residual	31066.107	447	69.499		
Total	32829.996	449			

Table 4 above shows an F-value of 11.25 that was significant at $P<0.005$. Consequently, the null hypothesis which states that "Students' learning styles (kinesthetic, visual and reading) does not significantly predict Basic Science learning outcomes in secondary schools" is rejected. This implies that the three learning styles when taken together predicted the Basic Science learning outcome. In order to identify the relative contribution of each of the learning styles, table 5 is presented below.

Table 5: Relative Contribution of each of the 3 Learning Styles on Basic Science Academic Achievement

	Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta	T	Sig.
(Constant)	31.260	1.708		18.533	.000
Kinesthetic Style	.886	.405	.129	2.187	.000
Visual Style	.853	.198	.324	6.919	.000
Reading Style	-.310	.143	-.051	.870	.153

Table 5 shows that two of the independent variables (kinesthetic and visual style) are potent predictors of Basic Science learning outcome. The most significant contributor was visual style (Beta = 0.324, t = 6.919, P<0.005). This is followed by kinesthetic learning style (Beta = .129, t = 0.950, P<0.005). While reading learning style (Beta = -0.051, t = .870, P>0.005) is negative and non- significant predictor of Basic Science learning outcome. This further shows that a student with visual and kinesthetic learning styles has a higher tendency and likelihood of a better academic achievement.

Discussion of Findings

The result of Hypothesis on erevealed that a significant and strong positive relationship ($r = 0.627$, $p < 0.05$) existed between kinesthetic learning style and Basic

Science learning outcomes. This is because the *p*-value of 0.000 was less than the set significant level of 0.05 for the analysis. This implies that kinesthetic learning style attributes to learners success Basic Science learning outcome. This could result from the fact that kinesthetic learners favour interaction with the physical world and learn best with an active "hands-on" approach which can produce multi-sensory learning that will enhance students' success in Basic Science. The findings corroborate the study of Jayanama (2019) who observed that strong significant relationship existed between kinesthetic learning styles and academic achievement of low proficiency students. The finding is in agreement with the assertion of Camacho et al. (2018) that kinesthetic learning style played a vital role in academic performance as those with a specified learning style, and less level of anxiety significantly scored higher mathematics achievement. Hypothesis two result revealed a significant but weak positive relationship ($r = 0.066$, $p < 0.05$) between visual learning style and Basic Science learning outcomes. However, the finding implies that an increase in visual learning style causes an increase in academic achievement. The finding complements the opinion of Mosafari et al. (2019) that learning through visual aids, classrooms visual board among others increase learning. This may be caused by attractions to visual aids gadgets thereby necessitating critical thinking and by implication good grasp of the content. The ability to search for fact becomes primary as the learner believes that all information would be relayed in the class and thus learning become progressive. The finding is consistent with Aliakbari & Qasemi (2012) claim that visual learners were high achievers and also confirms the findings of Khanal et al., (2019)that reported that a preference for a visual learning style was a predictor of academic success.

Hypothesis three revealed that there a positive but non- significant a significant relationship ($r = 0.627$, $p > 0.05$) between reading learning style and Basic Science learning outcomes. This is because the *p*-value of 0.000 was greater than the set significant level of 0.05 for the analysis. The finding could stem from the fact that science students tend to enjoy classes where practical is done, the excitement of the laboratory sessions, the field experiences, and sport arena feelings among others create a natural atmosphere for easy comprehension of the facts rather than the jotting, noting salient points, copying in his handwriting, underlying important phrases or sentences or theoretical and verbal explanations as asserted by Disanayaka (2014) and Gokalp (2013). The finding disagrees with Camacho et al. (2018) and Altun and Serin (2019) whose study found a significant relationship between reading learning style and academic performance.

Hypothesis four reveals that the three learning styles put together predicted the Basic Science learning outcome of the JS 2 students ($F= 11.25$; $p<.05$) at .05 level of significance; hence they are determinant of learning outcome. The implication of this result is that if these learning styles are practiced by teachers, it would enhance cognitive development that will generate success in students' performance. Again, from the result it becomes pertinent that if individuals' learning styles are determined, how they learn, and what kind of teaching is design for them, learning

that will lead to success in performance will be achieved. The result agrees with the Nja et al. (2019) who reported positive correlation between learning styles and academic performance of students. It was therefore recommended that teachers vary their teaching methods and strategies to pave way for students to use different learning styles. Table 5 reveals that visual (32.4%) made most significant contribution to the JS2 Basic Science learning outcome. Visual learning entails thinking of pictures rather than in words, students tend to learn holistically and learn best by seeing or visualizing what they need to learn. The implication of this finding is that, visual learning style is the best of the three styles in enhancing Basic Science learning outcome. This could point to the fact that Basic science as a subject prepares students at the upper basic level for the study of core science subjects through exploration by seeing and observing of living things and non-living things in an environment which visual learning style entails. The result agrees with the findings of Alumran (2008) who found that the learning styles of visual/verbal was good predictor of student grade point average (GPA). The findings of the study have explained the assertion of Grasha, 2002 that individuals must receive education in areas suitable for their learning styles and that a learner educated in an area having no relationship to his or her learning style may lack confidence, and he or she may be less successful academically.

Conclusion

Conclusively, the study discovered that each of the learning styles played prominent role in contributing to the Basic Science learning outcome and three learning styles put together predicted the Basic Science learning outcome of the JS 2 students with the visual and the kinesthetic learning styles made more significant contribution to the e overall performance of the learners.

Recommendations

Based on the findings of the study, the following recommendations are made:

1. Visual and the kinesthetic learning styles are recommended to teachers in the teaching process to improve academic achievement especially in Basic Science.
2. Teachers of Basic Science should accept that students differ in learning styles and use that knowledge to better facilitate learning.
3. Teachers should draw up learning style preference list for all learners in the Basic Science class before engaging in teaching activities. This will make teaching much easier as each learners would significantly benefit in his or her preferred mode of learning.

References

Afolabi, J.O (2022). Students' Perception of Learning Styles as Correlates of Senior Secondary School Mathematics Achievement in Ifo Local Government Area of Ogun State. Unpublished Ph. D Seminar. University of Benin, Benin City, Nigeria. Pp1-104.

Aliakbari, M. & Qasemi, N. (2012). On the relationship between Iranian EFL learners' learning style preference and their gender, proficiency level and achievement score. International Journal of Pedagogies and Learning, 7(3), 275–283.

Altun, H & Serin, O (2019). Determination of learning styles and achievement of talented students in the field of science and mathematics. Cypriot Journal of Educational Sciences, 14(1), 080-089.

Alumran, J .A. (2008). Learning styles in relation to gender field of study and academic achievement of Bahraini University. Students Individual Differences Research, 6(4), 303-316.

Bosman, A. & Schulze, S. (2012). Learning style preferences and mathematics achievement of secondary school learning. South African Journal of Education. Retrieved from http://www.doi.org/10.15700/sage.v38191440.

Camacho, V. I, Duad, V. & Veloso, A. F. B. (2018). Student attribute correlates of academic achievement in high school chemistry between grade 9 & 10 students. Journal of Education Science. Retrieved from https://www.academia.edu/34303892

Dissanayaka, T. D. (2014). The Learning Styles and the Preferred Teaching-Learning Strategies of First Year Physiotherapy Students. *International Journal of Scientific and Research Publications, 4*(7), 123-138

Diseth, A (2011). Self efficacy, goal orientation and learning strategies as mediators between proceeding and subsequent academic achievement. *Learning and Individual Differences, 21*(2), 191-195

Federal Republic of Nigeria (2016). National Policy on Education (6th Edition). NERDC Press

Fleming, N. (2015). The VARK modalities available at http://www.vark-learn.com

Gokalp, M. (2013). The Effect of Students' Learning Styles to Their Academic Success. *Creative Education, 4,* 627-632. Retrieved from https://www.doi.10.4236/ce.2013.410090.

Hammouri, H. (2014). Attitudinal and motivational variables related to mathematics achievement in Jordan. Findings from the Times International Mathematics and Science Study (TIMSS). *Education Research, 46*(3), 241-257. Retrieved from http://dx.doi org /101080/001318804.

Ilogu, G.C. (2012). Classroom learning and instruction. Lagos: Wealthsmith Books

Jalbani, L. R. (2014). The impact of effective teaching strategies on the students' academic performance and learning outcome. Munich, GRIN Verlag. Retrieved from https://www.grin.com/en/e-book/300046/the-impact-of-effective-teaching-

startgies-on-the-students-academic-performance.

Jayanama, B. (2019). Relationship between learning styles and academic achievement of low and high proficiency students in foundation english of Srinakharinwirot University. Journal of Human Sciences, 9 (2). Retrieved fromhttp://www.assumptionjournal.au.edu/index.php/Scholar/article/view/2980

Khanal, L., Giri, J., Shah, S., Koirala, S. & Rimal, J.(2019). Influence of learning style- preferences in academic performance in the subject of human anatomy: an institution based study among preclinical medical students. Journal of Advances in Medical Education and Practice. 10, 343-355. Retrieved from http://doi.10.2147/AMEP.S198878

Ktepi, B. M. (2016): VARK model; Salem Press Encyclopedia. Retrieved from http://www.eds.a.ebs

Matawal, D.B (2013). Effects of scaffolding instructional method on SS II students achievement in mathematics in Jos North LGA. Plateau State, Nigeria. International Journal of Research in Science, Technology and Mathematics Education, 1(2), 117- 125

Mosafari, H.R., Janatomakan, M., Shanfi, R., Ghadinejab, F., Andayesgar, B. & Khatony, A.(2020). The relationship between the vark learning styles and academic achievement in dental students. Journal of Advances in Medical Education and Practice. 11, 15-19. Retrieved from http://doi.org/10.2147/AMEP.S235002.

Orheruata, M. U;Lotobi, R. A & Gogaye, I. P(2017).Influence of Attitude and Motivation on Academic Achievement in Chemistry in Oredo Local Government Area, Edo State. African Journal of Studies in Education, 12 (1), 96-105.

Reddy, V., Winnaar, L., Visser, M., Feza-Piyose, N., Arends, F., Prinsloo, C. H., Mthethwa M., Juan, A. & Rogers, S. (2013). Highlights from TIMMS (2011), South Africa. Available at http://www.hsrc.ac.za/en/research-outputs/view63/63

Sadeghi, N., Kasim, Z.M., Tan, B.H. & Abdullah, F.S. (2012). Learning styles, personality types and reading comprehension performance. *English Language Teaching, 5*(4), 116-123.

Seif, A. (2006). Educational psychology. Tehran: Ahah.

Tuncay, E. (2011). The relationship among test society, study habits, achievement motivation and academic performance among Turkish high school students. *Education and Science. 36*(1).

VARK learn. (2006). The VARK modalities. Retrieved from VARK; http://vark-learn.com/introduction-to-vark/the-varkmodalities

Werhwein, R., Lunjan, H., & Dicarlo, S. (2007). Gender difference in learning styles preferences among undergraduate physiology students. *Advance in Physiology Education, 31* (2): 153-157.