Vol. 14(17), pp. 618-624, November, 2019
DOI: 10.5897/ERR2019.3806
Article Number: 91D939C62312
ISSN: 1990-3839

http://www.academicjournals.org/ERR

ACADEMIC JOURNALS
expand your knowledge

Educational Research and Reviews

Full Length Research Paper

The influence of learning styles on academic performance among science education undergraduates at the University of Calabar

Cecilia Obi Nja[1]*, Cornelius-Ukpepi Beneddtte Umali[2], Edoho Emmanuel Asuquo[1], and Richard Ekonesi Orim[1]

[1]Department of Science Education, Faculty of Education, University of Calabar, Nigeria.
[2]Department of Curriculum, Faculty of Education, University of Calabar, Nigeria.

Received 18 August, 2019; Accepted 28 October, 2019

This research work investigated the influence of learning styles on academic performance among Science Education undergraduates of the University of Calabar, Nigeria. The learning model used for this study comprised, visual, auditory, kindergarten, global analytical impulsive, reflective, individual and group models. Expo facto design was used for the study. The target population included all Science Education students in the University of Calabar. Two instruments were used for the study, Learning Styles Questionnaire (LSQ) and 2017/2018 second semester examination raw scores of Introduction to Science Education Result (ISER). The Cronbach's Alpha reliability coefficient was used for LSQ and the reliability coefficient was calculated, ranging from 0.62 to 0.82. Proportionate stratified and random sampling techniques were employed to get the sample. A total of two-hundred Science Education undergraduate students were chosen at random from the population. Findings showed that students have different learning styles preference. Data analysed revealed that there was a significant difference in student's choice of learning styles. There was a positive correlation between learning styles and academic performance of students. It was therefore recommended that teachers vary in their teaching methods and strategies to pave way for students to use different learning styles.

Key words: Learning styles, students, effective learning, performance, audio-visual.

INTRODUCTION

The development of any country be it economic, political, social, scientific and technological depends on academic performance of students. Students' academic performance is important in every country as it produces the type of graduates that will have significant impact to the society. When student's academic achievement is poor, it therefore means that graduates from those schools may not be able to perform the duties they were trained to do (Nja and Obi, 2019). It is not surprising to see buildings collapse because the civil engineer did not have a good education in school. In the medical sector, patients die in the hands of quack doctors. Fire outbreak in homes, offices and public places becomes the order of the day, because the wiring of buildings were poorly done by electrical engineers who did not have a good education.

*Corresponding author. E-mail:njacecilia@gmail.com.

The issue of student's poor academic performance in Science Education has continued unabated for a long time. Common reasons cited by researchers include among others: lack of instructional resources and ill equipped Chemistry laboratory, at times the laboratory exist only in the consciousness of the teachers (Nbina and Obomanu, 2011; Nkanu, 2009; Opera, 2008; Oriade, 2008). Although efforts have been made to remedy this situation something is still missing. There is the need for an indepth understanding of learning styles adopted by students.

Researchers have studied the relationship between students' learning styles and academic performance. In a research by Dalmolin et al. (2018) it was discovered that there was a positive connection between learning styles and academic performance of students. Magulod Jr. (2019) also conducted a research on learning styles and academic performance and found a significant relationship between learning styles and academic performance of students. The characteristics, strengths and preferences in the form, in which an individual receive and process information, is termed learning styles (Hsieh et al., 2011). Ghaedi and Jam (2014) defines learning styles as the changes among learners in using one or more senses to understand, organize, and, retain experiences. Fatemeh and Camellia (2018) study revealed that students prefer learning with divergent learning styles, as it enhance students' academic achievement.

Learning styles is a term that is used to explain various ways that learners acquire knowledge. It seeks to give an explanation on how people learn. The issue of individual difference is very crucial in learning styles, as it works under the premise that no two persons learn in same way. There is the understanding that every student learns differently. Learning styles therefore is an individual's unique way of absorbing, processing, comprehending and retaining information.

Students' learning styles are influenced by environmental, emotional and cognitive factors alongside their previous experiences. Learning style is primarily concerned with ''how'' students learn, not ''what ''they learn (Gokalp, 2013; Fardon, 2013). Knowledge of the various learning style preferences of students admitted in Science Education programme will eventually lead to more effective learning experiences. Alavi and Toozandehjani (2017) revealed that learning styles of students can enhance their learning. In the same vein, Barman et al. (2014) study on learning style and academic performance of students conclude that students' knowledge of their learning style can improve their academic performance. Therefore, in every school environment, be it primary, secondary or tertiary institutions, the academic performance of students is a pointer to the quality of learning experiences. Academic performance is evaluated in terms of students' remarkable scores across their subjects. This can be assessed through formative and summative evaluation.

Previous researches reviewed suggest that students have different learning styles of. The influence of learning style preferences and academic performance of students among science education undergraduate students in University of Calabar prompted the researcher to investigate the relationship existing among these variables. Recognizing students innate learning styles towards their studies will enable the University to design and implement educational interventions with the goal of enhancing their academic performance and the quality of their learning experiences.

VARK theory of learning

The VARK model of learning styles according to Desire (2019) suggests that there are four main types of learners. These four key types are: visual, auditory, reading and writing preference and Kinesthetic. Dunn and Dunn (1989) learning styles model comprises of visual, auditory, kindergarten, global analytical impulsive, reflective, individual and group.

Visual learners

These are learners who prefer to learn using sense of sight. Materials in the learning environment that will appeal to the sense of sight like charts, diagrams, graphs, maps and other pictures or graphically based forms of communication are important. Media movies, PowerPoint presentations or videos are necessary to assist visual learners in learning.

Aural/Auditory Learners

These are learners who prefer instructions that deal with sense organ of hearing. Spoken words during lectures, recordings, discussions are mechanisms that allow people with the sense of hearing to learn in their environments.

Read/Write learners

Learners under this group learn best when they read and write down on a paper or board what they have read. Their tools of choice are dictionaries, the Internet, PowerPoint, written responses and text signs.

Kinesthetic learners

This group learn by being involved in the activities of the learning process. The method of instruction in this group includes demonstrations, simulations, videos and case studies.

The above learning styles were categorized into three distinct groups namely physiology, psychological and sociology. Physiology comprises visual, auditory, kindergarten, psychological is made up of global, analytical, impulsive and reflective, while sociology included, individual and group (Dunn and Dunn, 1989).

Statement of the problem

Academic performance of undergraduate students in Science Education had witnessed a deplorable trend in the past years. Observations from 2014 to 2018 have consistently revealed poor performance in ''Introduction to science education course (SED124)'' examination organized by course lecturers at the end of every second semester of the academic session. Studies reviewed indicated teaching methods and lack of instructional materials/resources as reasons for poor academic performance of students in Sciences. Learning styles have been investigated in other Universities but not in University of Calabar, especially Science Education Department. The present exercise is an endeavour to empirically find out if undergraduate Science Education students differ in their learning styles. Against this background, the researcher tends to investigate the influence of learning styles on academic performance among Science Education undergraduates in the University of Calabar.

Purpose of the study

The purpose of the study was to investigate the influence of learning styles on academic performance among Science Education undergraduates in the University of Calabar. The specific objectives of this study sought to investigate:

(1) The learning preference of Science Education undergraduate students .
(2) Learning styles of Science Education undergraduate students with respect to sex.
(3). Science Education undergraduate students' level of study and its influence on their learning style preference.
(4) Science Education undergraduate students learning style and their academic performance.

Research questions

(1) What is the learning preference of Science Education undergraduate students?
(2) What are the learning styles of undergraduate Science Education students with respect to sex?
(3) How does students' level of study influence their learning style preference?
(4) What is the relationship between Science Education undergraduate students learning styles and their academic performance?

Statement of hypotheses

The following null hypotheses were formulated to guide the study:

(1) There is no significant difference in the learning styles of undergraduate Science Education students with respect to sex
(2) Students level of study does not significantly influence their learning style preference.
(3) There is no significant relationship between Science Education undergraduate learning style and their academic performance.

METHODOLOGY

Ex Post **Facto** research **design was used for the study.** It was used because, the researcher compared qualities that already exist with dependent variable. It is also known as "after the fact" research. This is so, as the researcher did not manipulate the independent variable. The research design compared the independent variable that is, students learning styles with the dependent variable, academic performance.

The target population includes all the Science Education students in the University of Calabar, Cross River State Nigeria. Proportionate stratified and random sampling techniques were employed to arrive at the sample. A total of two- hundred Science Education undergraduate students were chosen at random from the population. The basis for stratification was the students' discipline of study. These disciplines are Biology, Chemistry, Physics and Mathematics. The second variable was year of study: 1st, 2nd, 3rd, and 4th year participated in the study. Of the 200 students, ninety were males and one hundred and ten were females.

Two instruments were used for the study. They were Learning Style Questionnaire (LSQ) and raw scores of Introduction to Science Education Result (ISER) of 2017/2018 second semester examination. The LSQ was an adaptation of Dunn and Dunn (1989) learning styles model and as such, no validity was done as it was done by the developer of the instruments. LSQ was made up of 45 closed ended questions that elicited the nine learning styles of students. Learning Style Questionnaire instrument was trail tested to ascertain the internal consistency. Data collected were analysed for reliability. The Cronbach's Alpha reliability coefficient was used for LSQ and the reliability coefficient was calculated, ranging from 0.62 to 0.82. Reliability of 0.5 and above indicates that the instrument is reliable. Exploratory factor analysis was used to determine the pattern of relationship amongst the nine learning styles. The goal was to investigate the influence of learning styles on the over-all academic performance of students. Pearson product moment correlation coefficient was used to analyze data for learning styles and academic performance.

Scoring, ranking of learning style questionnaire and data analysis

The items on the LSQ were scored using rated options: 4 for strongly agreed, 3 for agreed, 2 for disagreed and 1 for strongly

Table 1. Reliability value of learning styles survey items (90 items).

Dimension	Element	Number of item	Cronbach Alpha
Physiological	Visual	5	0.68
	Auditory	5	0.72
	Kindergarten	5	0.69
Psychological	Kindergarten	5	0.80
	Global	5	0.79
	Analytical	5	0.75
	Impulsive	5	0.62
Sociological	Individual	5	0.82
	Group	5	0.69

Table 2. Learning style profile of students.

Learning style	F	%
Visual	189	95
Auditory	180	90
Kindergarten	134	67
Global	150	75
Analytical	125	63
Impulsive	80	40
Reflective	120	60
Individual	150	75
Group.	190	

disagreed. The highest point a student could score was 180 and the least was 45 points. In addressing research question 1, these frequencies were analyzed and then used to create a rating system for the overall level of learning style for each student. A score between '45-89', was assigned 'low', 90- 127 'moderate' and 128-180 'high'.

Regarding hypothesis 1, the independent t test was performed to identify if there were any significant differences in the level of learning styles of the Science Education students, based on sex (male and female). This t-test was performed as it is the appropriate analysis to be done, when comparing two independent means. Learning Styles based on the level of study was done, using one-way analysis of variance (ANOVA) test as found in hypothesis 2. Pearson product correlations analysis was used to investigate hypothesis 3, the relationship between learning styles and academic performance of Science Education undergraduate students. A 95% confidence level was the set level used in all statistical analyses.

RESULTS

Table 1 show the reliability of the learning style elements, ranging from 0.62 to 0.82. Table 2 show the learning styles profile of the students' revealed that visual element had the highest (95%), this was closely followed by auditory (90%) and the least was impulsive (40%). Examination of Table 3 showed better performance was from the use of impulsive style with 16% coefficient of variation. The visual style had 26%, the smaller the coefficient of variation, the better the performance. As seen in Table 4, physiological learning styles dimension have the best with 13% coefficient of variation, followed by the sociological, with a score of 11% and psychological having the least, 15%. Table 5 showed that 39% of students scored between 45-89 points of the items they responded to with low grading. The table also showed that 42% of students scored between 90 and 127, with a moderate grading; and 25% scored between 120 and 180 and was graded high.

Analysis of data, using independent t test in Table 6, reveal that the calculated t value was 2.63 and the *p*-value was 0.009174. This was with 198° of freedom at 0.05 level of confidence. The null hypothesis, which states there is no significant difference in the learning styles of undergraduate Science Education students with respect to sex, was not accepted. This is so, as the calculated value of 2.63 was higher than the *p* value. When the calculated value is higher than the *p* value, the null hypothesis is retained. Sex significantly influences the learning styles of science education students.

Table 3. Mean score and standard deviation score of students learning styles elements.

Learning style element	Mean score	Standard deviation	Coefficient of variation (%)
Visual	16.49	4,20	26
Auditory	16.75	4.00	24
Kindergarten	15.14	3.85	25
Kindergarten	16,00	3,90	24
Global	15.06	3.10	21
Analytical	14.69	2.98	20
Impulsive	13.06	2.10	16.
Individual	14.01	2.85	20
Group	15.80	3,60	23

Table 4. Mean score and standard deviation score of students learning style dimension.

Learning style dimension	Mean score	Standard deviation	Coefficient of variation (%)
Psychological	16.15	2.43	15
Physiological	15.65	2.05	13
Sociological	14.81	1.58	11

Table 5. Score rating, frequency and percentage of learning styles.

Score	Rating	Rating of description	Frequency	Percentage
45-89	1	Low	77	39
90- 127	2	Moderate	83	42
128-180	3	High	50	25

Table 6. Independent t test of the difference in sex, and learning styles of science education students.

Sex	N	Mean	Std. deviation	t- Cal
Male	90	153.27	232.79	2.63
Female	110	140.05	1684.34	

The f-ratio value is 19.62532. The p-value is < 0.00001. The result is significant at $p < 0.05$. A cursory view of Table 7, descriptive statistics, reveal that year 2 students had a higher mean (159.48) that was followed by year three (141.96), and year one had the lowest mean (117.06). The one -way analysis of variance in that same Table 7 showed that the F value was 19.62532; whereas the p-value was < 0.00001 at 0.05 significant levels. The null hypothesis which sought to find out if there is a significant difference in the Learning Styles of Science Education students, with respect to year of study, was not accepted. This is so as the calculated F = 19.62532 value was higher than the p-value that is < 0.00001. Students year of study significantly affect their learning styles.

The result summarized in Table 8 indicate that the calculated r-value was 0.7765. The null hypothesis which stated that there is no significant relationship between Science Education undergraduate learning styles and their academic performance was not accepted. When the calculated value is from 0.5 and above, the result is significant. The alternate hypothesis was upheld. Hence, there was a significant relationship between learning style and academic performance of Science Education undergraduate students. The relationship was positive, meaning that academic performance increases with the type of learning styles adopted by students.

DISCUSSION

This study examined the learning styles preference of students (Visual, auditory, kindergarten, global,

Table 7. One-way analysis of variance (ANOVA) of the comparison of the distribution of learning styles based on level of study.

Summary of data	Treatments				Total
	1	2	3	4	
N	50	50	50	50	200
∑X	5853	7974	7098	6920	27845
Mean	117.06	159.48	141.96	138.4	139.225
$\sum X^2$	810391	1279568	1017670	966000	4073629
Std.Dev.	50.5559	12.6769	14.3128	12.9929	31.4562
Result details					
Source	**SS**		**Df**	**MS**	
Between-treatments	45485.655		3	15161.885	*F* = 19.62532
Within-treatments	151423.22		196	772.5674	
Total	196908.875		199		

Table 8. Pearson product correlations analysis of the relationship between learning styles and academic performance of undergraduate Science Education (N=200).

Variable	∑X ∑Y	∑X2 ∑Y2	∑X Y	Df	r-cal
Learning styles	13827	138.27			
Academic performance	13107	131.07	162297.11	198	0.7765

$p < 0.05$.

analytical, impulsive, reflective, individual, group) on the academic performance of Science Education undergraduate students of University of Calabar, Nigeria. The first research question was to find out the learning styles that existed amongst Science Education undergraduate students. The findings of this research as recorded in Table 2 show that the element visual had the highest (95%), this was closely followed by auditory (90%) and the least was impulsive (40%). This is not unconnected with the fact that, what we see sticks in the memory for a longer time and therefore recall is enhanced. The result also showed that, students prefer visual and auditory, than other learning styles. This work confirms the earlier study of Fatemeh and Camellia (2018), whose study revealed that students prefer learning with divergent learning styles.

The first null hypothesis states that there is no significant difference in the learning styles of undergraduate Science Education students with respect to sex. Analysis of the data using independent t test in Table 6 reveal that the calculated t value was 2.63 and the *p*-value was 0.009174, with 198° of freedom at 0.05 level of confidence. The null hypothesis was not accepted as the calculated value of 2.63 is significant with a p value of 0.009174; while the alternate hypothesis was accepted. In this part of the world, the upbringing of the girl child is different from that of the boy child. The males had a higher mean in learning styles preference 153.27 and the females had a lower mean of 140.05. The boy child is free in his preference at an early stage, but the girl child is controlled. The boys could therefore choose learning styles freely, but the girl child chose fewer items.

The second null hypothesis sought to find out if there is a significant difference in the Learning Style of Science Education students with respect to the year of study. A cursory view of Table 7 reveal that year 2 students had a higher mean (159.48); this was followed by year three (141.96), while year one had the lowest mean (117.06). The one-way analysis of variance in that same Table 7 showed that the F value was 19.62532 and p-value was < 0.00001 at 0.05 significant levels. The null hypothesis was retained. Year of study did not significantly affect student's choice of learning styles because many factors may have come into play in choosing learning style. Students' prior knowledge may have influenced their choice because what students do not know or understand or have not been exposed to will not be accepted by the students.

The third null hypothesis stated that there is no significant relationship between Science Education undergraduate learning style and their academic performance. The result summarized in Table 8 indicated that the calculated r-value of 0.7765 was greater than the r-critical value of 0.159 at 0.05 level of significance, with 198° of freedom. Table 8 indicates that there is a significant relationship between learning styles and

academic performance of students. This finding of the study is consistent with that of Fatemeh and Camellia (2018) as well as Vaishnav (2013), stating that there is a positive relationship between learning styles and academic performance. Likewise, Magulod Jr. (2019), Dalmolin et al. (2018) and Abidin et al. (2011) observed the significant relationship between academic achievement and learning styles.

From the result, it is crystal clear that learning styles affect student's academic performance. Majority of the students prefer visual and auditory learning styles as against other learning styles. This study collaborates with earlier studies by Slavin (2010), Onasanya and Adegbiya (2007), and Idris (2015). Those studies discovered that students learn better and have good academic performance when audio-visual materials are presented during teaching and learning. The positive relationship between kinesthetic, visual, tactile, and group learning styles and the academic achievement of the students admitted into Science Education programme indicate that when students have access to visual information during learning activities, their academic performance is enhanced.

Conclusion

This research has revealed that students have multiple learning styles. No one learning style is self-sufficient for students' academic performance. The best combination is the audio-visual learning styles. When students have knowledge of their learning style preferences and harness their various learning styles, it may improve their academic performance.

RECOMMENDATION

In view of the above findings, it is recommended that:

(i) Teachers vary their teaching methods and strategies to pave way for students to use different learning styles.
(ii) Students should endeavor to identify their unique learning styles and use them.
(iii) School administrators should provide learning resources that covers all the learning styles.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

REFERENCES

Alavi S, Toozandehjani H (2017). The Relationship between Learning Styles and Students' Identity Styles. Open Journal of Psychiatry 7:90-102.

Barman A, Aziz R, Yusoff Y (2014). Learning style awareness and academic performance of students. South East Asian Journal of Medical Education 8(1).

Dalmolin A, Mackeivicz G, Pochapski M, Pilatti G, Santos F (2018). Learning styles preferences and e-learning experience of undergraduate dental students. Revista de Odontologia da UNESP 47(3):175-182.

Desire H (2019). VARK Learning Styles. Science and EDUCATION https://www.ehow.co.uk/info_7978059_vark-learning-styles.html

Dunn R, Dunn K (1989). The Dunn and Dunn learning style model of instruction. https://tracyharringtonatkinson.com/dunn-and-dunn-learning-style/

Fardon M (2013). Relationship between students learning styles preference and exams achievement in differing form of assessment during an advanced apprenticeship at a Vocational Further Education College. Institute of learning; Department of Education, University of oxford.

Fatemeh V, Camellia T (2018). The effect of teaching based on dominant learning style on nursing students' academic achievement. Nurse Education in Practice 28:103-108.

Gokalp M (2013) The Effect of Students Learning Style to Their Academic Success. Creative Education 10(1):623-632.

Ghaedi Z, Jam B (2014). The relationship between Learning Styles and Motivation for Higher Education in EFL Students. Theory and Practice in Language Studies 4(6):1232-1237.

Hsieh SW, Jang YR, Hwang GJ, Chen NS (2011). Effects of teaching & learning styles on students' reflection levels for ubiquitous learning. Computers and Education 57:1194-1201.

Idris AO (2015). The effect of Audio-visual materials in teaching and learning of speaking of skills in junior secondary schools in Katsina State Nigeria. International Journal of Social Science and Humanities Research 3(3):50-58.

Magulod Jr GC (2019). Learning Styles, Study Habits and Academic Performance of Filipino University Students in Applied Science Courses: Implications For Instruction . Journal of Technology and Science Education 9(2):184-198.

Nbina JB, Obomanu BJ (2011). Assessment of the effect of problem solving instructional strategies on students' achievement and retention in chemistry with respect to location in rivers State. World Journal of Education 1(2):27-79.

Nja CO, Obi JJ (2019). Effect of Improvised Instructional Materials on Academic Achievement of SS1 Chemistry Students in Cross River State Nigeria. International Journal of Applied Research Journal of Applied Research 5(7):444-448.

Nkanu M (2009). Relationship between educational resources and students' academic performance in Akwa Ibom State (Doctorate Dissertation).

Opera MF (2008). Utilization of laboratory facilities and students' academic performance (Master Thesis).

Oriade TI (2008). An empirical study of the Utilization of instructional materials and Laboratory resources in Biology. Curriculum Implementation 8:196-203.

Onasanya SA, Adegbiya MV (2007). Practical handbook on instructional media 2nd edition. Illorin Graphicon Publishers.

Slavin RE (2010). A synthesis of research on language of reading instruction for English Language Learners. Review of Educational Research 75(2):247-254.