Influence of Learning Styles on Post Graduate Students' Academic Achievement on Innovations in Science Education

[1]JohnBosco O.C. Okekeokosisi, [2] U. V. Alison, [3]Samuel Alfayo Boh
gentlejack10@yahoo.com, vu.alison@unizik.edu.ng

[1]Computer Education Department, [2]Science Education Department, [3]Department of Educational Foundations
[1]School of Secondary Education (Science), [2,3]Faculty of Education
[1]Federal College of Education (Technical), Asaba, Delta State, Nigeria.
[2]Nnamdi Azikiwe University, Awka, Anambra State, Nigeria.
[3]Federal University of Kashere, Gombe State, Nigeria.

Abstract

This research examines the influence of learning style on post graduate students' achievement in innovations in science education. The study adopted an ex-post facto research design. The population was made up of all 2023 / 2024 Post graduate (PG) students in the faculty of education of Nigerian universities. Simple random sampling was used to select 3 out of 5 federal universities in the South-East geopolitical zones. The sample consisted of 232 Master of Science Education (M.Ed) students. Post Graduate Students' Learning Style Inventory (PGSLSI) and Lecturers' Academic Achievement Test On Innovations In Science Education (LACTOIISE) were instruments adopted and adapted for data collection. The internal consistency reliability indices of the instruments were established to be 0.90 and 0.82 using KR-20 formula and Cronbach Alpha respectively. Data were analysed using percentages, mean and standard deviation. The findings of the study revealed, amongst others that, there are variations in the learning styles of the respondents; preferable learning styles yielded better academic achievement in innovations in science education. Based on the findings, it was recommended amongst others that lecturers should consider differences in learning preferences of PG students in the classroom as often as possible by choosing forms of social interaction. They should also consider various forms of exercise according to learning objectives.

Keywords: Learning, Visual, Kinesthetic,, PG students, Achievement

Introduction

Education is an engine for the growth and progress of any society. Education not only imparts knowledge, skills and inculcates values, but is also responsible for building human capital which breeds, drives and sets technological innovation and economic growth. Awoyele, Jerole and Okebukilo in Okekeokosisi and Anaekwe (2015) described education as a weapon for combating ignorance, poverty, and diseases; as a bridge between civilizations; as a rocket for transporting man from a state of intellectuals' subservience to a state of intellectual sovereignty. For the importance of education to be achieved in our country Nigeria, learner and learners' learning style should be taken cognizance of.

A learner is said to be a person who is trying to gain knowledge or skill in something by studying, practising or being taught. Tech (2024) defined a learner as an individual who is willing to learn and understand new things. It is also seen as anyone who is embracing a new way of thinking. McCombs (2024) added that learners are individual who has zeal to acquire knowledge, skills and value either through experiences, perspectives – thoughts, interests, capacities, backgrounds, talents and need for the intended knowledge. The assertion was supported by Okekeokosisi and Okeke (2015) listed the characteristics of a learner as; curiosity, creative, adaptive, collaborative, resilient in the face of challenges, able to embrace change, open to diverse viewpoints and experiences. Thus, one can see that though the learner is the central focus as far as education is concerned, the teacher is the hub of any educational system because a school cannot be better than their teachers. Education is judged to be effective when the recipients are seen to be productive and capable of contributing to the progress of the society. Such are attributed to the learning styles adopted or adapted by the learner as a result of learning experiences or during instructional delivery.

Learning styles (LS) are set of factors, behaviours and attitudes that facilitate learning for an individual in a given situation. Wiki (2024) refers LS as a range of theories that aim to account for differences in individual learning. It is a way to absorb and process the information obtained, which is used as an indicator to act and relate to the environment (Khaira, 2023). Deporter and Hernacki (2007) defined LS as a person's learning style that is a combination of how the learner absorbs, organizes information acquired and processes the acquired information. In addition, Li, Medwell, Wray, Wang and Liu (2016) opined that LS is a characteristic of cognitive, affective and psychomotor behavior as an indicator that acts relatively stable for learners to interrelate and react to the learning environment. Equally, it is a specific behavior in receiving new information and developing new skills, as well as the process of storing new information or skills. In developing new skills, learners may combine two or three LS during the learning process to achieve effectively. Thus, learning styles centre on personality theories. The theory focused on the relationship between memory and instructional methods to ascertain students' intelligence quotient (IQ). The theory was propounded by Neil Fleming in (1987). Felm called its theory visual, auditory, reading / writing, kinesthetic (VARK). Visual learners learn to use charts, graphs, and pictures. Auditory learners learn by listening to lectures. Reading / writing calls for graphs, a darning through reading and writing while kinesthetic learning style, learners learn through doing and experiencing. VARK theory states that individuals has unique learning preferences. Femi

added that VARK are sensory modalities that are used for learning information. The four modalities seem to reflect the experiences of students and teachers. These styles reflect the different ways individuals prefer to absorb, process, and retain information. In this study, the researchers made use of four different learning styles of Femi to determine which learning style is more preferable by postgraduate students when learning concepts in innovations in science education.

Postgraduate schools are where further academic or professional degrees, certificates, diplomas, or other qualifications are obtained. Finetti (2022) defined post-graduate school (PG school) as the range of higher degrees that past the undergraduate degree. Higher education offered at PG schools is to raise the standard of education offered to graduate. It is an opportunity given to learners to develop and deepen their knowledge in a specific field of interest (Eacersall, Drake & Millward; 2024). These are opportunities given to further academicians, investors, and professionals in divert fields of study. Learners who have undergone post-graduate studies equip themselves with knowledge, skills, attitudes, and values that could be enhanced. This helps to build productive citizens that could build a democratic nation and as well tackle the economic, societal, tribal (ethnic) differences, climatic change, and political and religious challenges (Okekeokosisi, 2024). When education is equipped with the stated benefits as listed by Okekeokosisi (2024), learning is said to have taken place.

Academic achievement is the extent to which a student has accomplished his / her short or long-term goals. It is the success in bringing an effort to a desired end. Accordingly, Mbonu and Okoli (2009) state that the attained ability or degree of competence in school tasks is usually measured by standardized tests and expressed in grades based on norms derived from a wide sampling of students' achievement. Okekeokosisi and Okigbo (2019) attribute learners' achievement to active involvement in the learning process, which would stimulate the three domains of learning (cognitive, affective, and psychomotor) that are characteristic of learning style. Thus, learners' academic achievement is the outcome of education and the extent to which a student has achieved their educational goal. In this study, the researchers made use of four learning styles which are visual, auditory, reading/writing, and kinesthetic to determine if the four learning styles would influence learners' academic achievement in learning concepts in innovations in science education.

Statement of the Problem

Advanced level of study that is beyond the level of bachelor's degree has shown concern to researchers like Marantika, 2022; Esewe and Ogunleye (2021) over the difficulty faced by postgraduate students in gaining more comprehensive knowledge within a particular area of a discipline. Even if students pay little attention to knowledge, the mismatch between the preferred learning style of PG students and those of teachers – lecturers is one of the problems associated with PG students' learning style. The fostering of diverse styles of learning appears to have been neglected in the teaching concepts in innovations in science education. Thus, a mismatch exists between PG students' learning style and lecturers' teaching style, which creates a kind of frustration between many PG students and lecturers. It may be that this basic conflict is the root of the dilemma connected with learning style in today's learning at tertiary institutions in Nigeria. This study seeks to evaluate the learning styles of PG students and the extent learning style preferences could influence their academic achievement in Innovations in Science Education.

Purpose of the study

The purpose of this study was to investigate the influence of learning style on academic achievement of postgraduate students in Innovations in Science Education. Specifically, the study sought to:

1. Identify the prevailing learning styles among PG students exposed to innovations in science education.
2. Find out PG students' academic achievement in innovations in science education among visual, auditory, reading/writing, and kinesthetic (VAR and K) learning styles.
3. Identify how PG students' learning style preferences vary concerning academic achievement during innovations in science education.

Research Questions

The following research questions guided the study;

1. What proportion of PG students are exposed to visual, auditory, reading/writing, and kinesthetic (VAR and K) learning styles during innovations in science education?
2. What is the difference in the mean academic achievement scores of PG students when the learning styles are matched during innovations in science education?
3. How do PG students' learning style preferences vary concerning academic achievement during innovations in science education?

Method

An ex-post facto research design was used for this study. According to Nworgu (2015), ex-post facto design is appropriate where dependent variables of interest cannot be manipulated and the researchers have no control over them. The study was carried out in Nigerian federal universities. Simple random sampling techniques balloting without replacement were used to select only federal universities in South-East geo-political zones out of the six geo-political zones in Nigeria. The South-East zone has 5 federal universities that out were accredited and approved to admit students for postgraduate studies. Thus, purposive sampling was employed to select 3 out of 5 federal universities in the South-East geo-political zones. The selected universities- institutions of higher learning are established as circular universities concerning National University Commission Act along with the national policy on education of 2014 objectives. These institutions must have been established, admitted, and graduated a set from post-graduate school (PG). Purposive sampling techniques were used to select only faculty of education out of numerous faculties under PG school depending on the institution. The target population was admitted Postgraduate (PG) students of 2023/2024 set from the three federal universities in south east Nigeria. Faculty of education according to National University Commission may admit students for higher education in the following departments depending on the institution; educational foundations, science education, physical and health education, library and information science, guidance and counseling, early childhood and primary education, education management and policy, educational technology, technology and vocational education. Each department has a speciality for students to be enrolled in. In faculties of education, the following programmes are accredited, approved, and have admitted students in; Post graduate diploma in Education, Masters' degree program, and Doctor of Philosophy. A lucky dip sampling technique was used to select M.Ed Science Education Students for the study. Science education was selected and used for the study.

A sample size of 232 master's students was used. Two instruments used for data collection were an adapted learning style inventory of Orwell (1985) and adopted Lecturers' Academic Achievement Test On Innovations In Science Education (LACTOIISE). The adapted learning style inventory of Orwell was renamed by the researchers as Post Graduate Students' Learning Style Inventory (PGSLSI) to be in line with the study. PGSLSI and LACTOIISE were validated by experts. Its reliability indices were established to be 0.90 and 0.82 respectively using the KR-20 formula and Cronbach Alpha. The two instruments were administered to students the same day by their lecturers as agreed with the researchers. The

administered instruments were coded likewise the students' answer booklets. The coded instruments and students' answer booklets were retrieved from the research subjects. The coded instruments and students' answer booklets were marked, scored, and recorded by their lecturers. Their coded recorded scores were handed over to the researchers. Data were analyzed using percentages, mean, and standard deviation.

Results

Research Question 1: What proportion of PG students are exposed to visual, auditory, reading/writing, kinesthetic (VAR and K) learning styles during innovations in science education?

Table 1: Frequency and Percentage proportion of PG students exposed to visual, auditory, reading/writing, kinesthetic (VAR and K) learning styles during innovations in science instructional delivery.

Learning style	No. of PG students	%Proportion of PG students exposed to VAR and K learning styles
Visual	65	28
Auditory	54	24
Reading / writing	58	25
Kinesthetic	55	23
Total	**232**	

Table 1 indicates that 65 (28%) of the PG students had visual learning styles. These numbers were the highest recorded among the students. This is followed by 58 PG students (25%) with reading/writing learning styles. 55 PG students (23%) are kinesthetic learning styles. Lastly, 54 (24%) PG students had auditory learning styles, which is the least number of students.

Research Question 2: What is the difference in the mean academic achievement scores of PG students when (VAR and K) learning styles during innovations in science education?

Table 2: Difference in the mean academic achievement scores of PG students when exposed to VAR and K learning styles during innovations in science education

Learning style	Ẍ	SD	Ẍ difference b/w V & A	Ẍ difference b/w A &R	Ẍ difference b/w R & K	Ẍ difference b/w K & A
Visual	27.22	3.13				
			5.15			
Auditory	22.07	2.26				
				4.93		
Reading / writing	27.00	2.62				
					3.26	
Kinesthetic	23.71	3.3				1.64

Data in Table 2 indicates that postgraduate students with visual learning styles had mean achievement scores of 27.22 which is the highest among the students. For reading/writing, PG students had a mean achievement score of 27.00. This is followed by kinesthetic learners with mean achievement scores of 23.71. It is noted that students with auditory learning styles had a mean achievement scores of 22.07 which is the lowest among the students.

Research Question 3: How do PG students' learning style preferences vary concerning academic achievement during innovations in science education?

Results as revealed in Table 2 x-rays that learning styles when matched aid academic achievement. Thus, students that lead with V & A had a mean difference of 5.15 which is the highest among all matched learning styles. Learners that learned with A & R had a mean of 4.93 while R & K learners had a mean of 3.26 which is the third match. Finally, those who prefer to learn with K & A had a mean of 1.64 which is the least of all learning styles. This implies that the majority of PG students in science education with a master's degree prefer to learn through V & A learning styles.

Discussion

Many PG students (28%) preferred visual learning style, reading/writing, and auditory learning style (LS) are in the intermediate category. Kinesthetic LS has the lowest percentage of PG students in science education under master's program that prefer to learn through such learning style. Thus, variations have been observed in PG students in science education under master's program learning style. This is in line with the findings of Zapalska and Brozik (2006) that students' achievement could be improved by offering appropriate guidance to each student's learning style, not minding learners' developmental stages and age. Mohammadi, Mobarhan, Mohammadi & Ferns (2015) added that if the teacher understands each students' learning style and applies it in the learning process, students will be more satisfied with the whole process and in the end, learning outcomes will be better. Therefore, each learning style increases students' level of success, especially when it is tailored to individual needs.

The analysis of the matched preferred learning style of PG students showed that V&A LS is most preferred by adult learners of science education under master's programmes which aided in their academic achievement. According to the adage of Rief (1993) which says that 50% of what learners see and hear promotes achievement and retention. This was supported by the findings of Marantika (2022) which revealed that the application of multisensory learning styles increases active participation of students in the learning process. Hence, for effective learning outcomes to take place, lecturers need to design learning activities that encourage students to use their senses more. This has to do with the sense to see, hear, say, and perform tasks to understand the information delivered.

Conclusion

The results show that PG students' learning styles varied concerning individual learners. Every learner has more than one learning style. Thus, every learner knows his / her weaknesses in learning and decides which learning style is suitable for him/her. As a result, achievement increases, self-confidence grows and learning attitudes develop. Furthermore, the differences in learning styles allow lecturers to use various teaching methods.

Recommendations

Based on the findings of the study, the following recommendations were made;

- Lecturers should consider differences in learning preferences in the classroom as often as possible by choosing forms of social interaction and various forms of exercise according to learning objectives

- It is necessary to disclose other factors that affect students' learning outcomes other than learning styles

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