



STEMJAS



STEM JOURNAL OF ANAMBRA STAN

Volume 4(1);2022

ISSN:2705-1579

EDITOR-IN-CHIEF
PROF. RITA N. NNOROM



STEM Journal of Anambra State (STEMJAS), 4(1); 2022



STEM JOURNAL

OF ANAMBRA STATE

(STEMJAS), 4(1); 2022



STEM Journal of Anambra State (STEMJAS), 4(1); 2022



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ISSN: 2705-1579

Published & Printed by:

FAB ANIEH NIGERIA LIMITED

Fab Anieh House

Opposite COFI Premium Lounge

Okpuno, Awka

Tel: 08035619395

gmail: fabprezz82@gmail.com



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EDITORIAL

STEM Journal of Anambra STAN (STEMJAS) is a publication of **Science Teachers Association of Nigeria, Anambra State Chapter**. STEMJAS is developed to disseminate information on Science, Technology, Engineering and Mathematics (STEM) to teachers, teacher-trainers, researchers and other interested persons. Articles that are of relevance to STEM education are published in this journal.

We are grateful to the contributors and hope that our readers will enjoy reading these contributions.

Prof. Rita N. Nnorom

Editor-in-Chief



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LEARNING STYLES AND ACADEMIC PERFORMANCE OF SENIOR SECONDARY SCHOOLS IN ENUGU STATE, NIGERIA

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Abstract

This study determined the extent at which learning styles have affected academic performance of senior secondary schools in Enugu State using auditory learning and kinesthetic learning style on academic performance of students in senior secondary schools in Oji-River L.G.A. of Enugu State. This study adopted the survey research design. A sample size of 478 was used from a population of 572 respondents. The study revealed that auditory and kinesthetic learning styles enhance academic performance of students in senior secondary schools in Oji-River L.G.A. of Enugu. Teachers should also help their students to understand their learning style preferences and make use of such to develop life-long learners.

Keywords: Learning style and Academic performance



Introduction

The capability of a nation's human resources is crucial to its development. As a society's knowledge and technological advancement depend on the quality and preparation of scientists and technologists with solid technical understanding, personal and interpersonal skills. As a result, it is of the utmost importance that the goals, components, and procedures for information technology and industrial technology programs at higher education institutions are defined to the highest possible standards. Common goods include education and knowledge. According to UNESCO (2015), knowledge acquisition and application are components of societal endeavor. According to Magulod (2017a, 2017b), Taking into account the various learning styles and preferences of university students is one important step that must be taken to ensure a high-quality and optimal learning experience. The term "learning style" refers to the unique ways in which students learn and process information.

According to Dunn & Dunn (1993), the idea of learning styles was modified to include a variety of approaches to thinking, responding, seeing, hearing, touching, rationalizing, and forming knowledge or learning. The individual student may have a better understanding of how to function effectively in the school environment and satisfy intellectual and emotional needs once their learning style has been identified and nurtured. Educators can use a variety of resources to create instructions that maximize learning by being aware of learning preferences and individual learning styles. Moeinikia and Zahed-Babelan (2010) and Williams, Brown, and Etherington (2013) both confirm that there is a positive link between learning styles and academic performance in university settings. Several previous studies have examined the relationship between college students' learning styles and academic performance. According to Hsieh, Jang, Hwang, and Chen (2011), a person's learning style is defined as the characteristics, strengths, and preferences in the manner in which they receive and process information. In addition, it refers to the fact that everyone learns in their own unique manner (Gokalp, 2013).

The majority of Nigerian high school teachers do not know how students learn languages, especially sciences. It is evident that students have not yet learned how to learn or discovered their preferred learning styles for various learning material or content in this subject, as evidenced by the current low achievement rate in science. Also, teachers haven't realized how diverse their students are in a typical classroom, so they keep using the same old ways of teaching in every situation. As a result, students become uninterested and unfocused in class, perform poorly on tests, become



demotivated about the subject, the curriculum, and themselves, and, in worse cases, quit school altogether.

However, auditory learning style is where a person learns through listening. An auditory learner depends on hearing and speaking as a main way of learning. They also use their listening and repeating skills to sort through the information that is sent to them (Bethel-Eke & Eremie, 2017). It also entails words; emphasis on listening and speaking. These individuals discover information through listening and interpreting information by the means of pitch, emphasis and speed. These individuals gain knowledge from reading out loud in the classroom and may not have a full understanding of information that is written. More so, a kinesthetic-tactile learning style requires that you manipulate or touch material to learn. Kinesthetic-tactile techniques are used in combination with visual and/or auditory study techniques, producing multi-sensory learning. It also involves movement and action; emphasis on doing, direct involvement, demonstrating, showing etc. Individuals that are kinesthetic learn best with an active “hands-on” approach. These learners favour interaction with the physical world. Most of the time kinesthetic learners have a difficult time staying on target and can become unfocused effortlessly

The relationship between academic performance and students' learning styles has been the subject of research. Dalmolin, Mackeivicz, Pochapski, Pilatti, and Santos (2018) found that students' academic performance was positively correlated with their learning styles. In addition, a study on learning styles and academic performance by Magulod Jr. (2019) revealed a significant link between students' learning styles and academic performance. Learning styles are the characteristic, strengths, and preferences of how an individual receives and processes information (Hsieh et al., 2011). According to a study by Fatemeh and Camellia (2018), students prefer learning with a variety of learning styles because it boosts academic achievement. The majority of these studies were carried out outside of the country. In a developing economy like Nigeria, it is necessary to determine how much these learning styles have contributed to academic performance thus far. This study therefore determined the extent learning styles has affected academic performance of senior secondary schools in Enugu State, Nigeria. Specifically, the study intends to:

1. Examine how auditory learning style enhance academic performance of students in senior secondary schools in Oji-River L.G.A. of Enugu State



2. Ascertain the effect of kinesthetic learning style on academic performance of students in senior secondary schools in Oji-River L.G.A. of Enugu State.

Literature Review

Learning Styles

The various ways in which students acquire knowledge are referred to as learning styles. It aims to provide a rationale for how people learn. Since no two people learn in the same way, the issue of individual differences is very important to learning styles. It is acknowledged that each student learns differently. Therefore, a person's unique learning style is how they absorb, process, comprehend, and retain information.

Along with their prior experiences, students' learning styles are influenced by environmental, emotional, and cognitive factors. According to Gokalp (2013), learning style is primarily concerned with "how" students learn rather than "what" they learn. However, more successful learning experiences will eventually result from a better understanding of the various learning styles preferred by students admitted to the Science Education program (Fardon, 2013). According to Alavi and Toozandehjani (2017), students' learning styles can help them learn more effectively. In a similar vein, a study by Barman, Aziz, and Yusoff (2014) on students' academic performance and learning styles came to the conclusion that students' knowledge of their learning styles can help them succeed academically. As a result, students' academic performance is a measure of the quality of their learning experiences in every school setting, whether primary, secondary, or tertiary. Students' remarkable scores in all of their subjects are used to evaluate their academic performance. Formative and summative evaluations can be used to evaluate this.

According to Keefe (1987), a learning style is a regular way of functioning that reflects the underlying causes of learning behavior. Visual, auditory, and kinesthetic learning styles are all examples of these. A student's learning style is both a characteristic that reveals how they learn and how they enjoy learning and an instructional strategy that influences the content, context, and cognition of learning. According to previous research (Graf, Liu, & Kinshuk, 2010), any learning or instructional process could benefit from taking into account the appropriate dimensions of a student's learning style.

A learning style called "auditory learning" is one in which people learn by listening. The primary methods of learning for an auditory learner are speaking and hearing. They also sort through the information that is sent to them by using their skills of listening



and repeating. Words are also involved; importance placed on speaking and listening (Bethel-Eke and Eremie, 2017). These people learn by listening to other people and interpreting what they say using speed, emphasis, and pitch. Because these students learn by reading aloud in class, they may not fully comprehend written material. A tape recorder, take part in discussion groups and lectures, and so on. They will say things like "tell me" and "let us talk it over" and will do a better job of a new task if they hear instructions from an expert. According to Drago and Wagner (2004), aural students are easily disturbed by noise. Miller (2001) also made the observation that students who have an aural learning style can remember information by reading loudly or by mouthing the words they read, particularly when learning something new.

Nja, Umali, Asuquo, and Orim (2019), claim that these are students who would rather receive instruction that focuses on the sense organ of hearing. Mechanisms such as spoken words during lectures, recordings, and discussions enable hearing individuals to learn in their surroundings.

By participating in the activities of the learning process, this group gains knowledge. This group uses videos, case studies, demonstrations, and simulations to teach (Nja et al., 2019). To learn with a kinesthetic-tactile learning style, you must manipulate or touch the material. Multi-sensory learning is achieved by combining kinesthetic-tactile techniques with visual and/or auditory study methods (Bethel-Eke and Eremie, 2017). Additionally, it entails movement and action; a focus on doing, being directly involved, demonstrating, etc. Kinesthetic learners learn best through active, "hands-on" instruction. These students prefer to interact with the real world. In Kinesthetic learning style most of the time, learners have trouble staying on course and can easily lose focus. According to Cope, Moseley, Hall, and Ecclestone (2004), students with this learning style prefer physical experiences like touching, feeling, holding, doing, trial-and-error, field trips, and laboratory work. To put it another way, they learn best by doing. They will say things like "let me try," "how do you feel," and "let me try." The best way for them to do a new task is to try it out and learn as they go. According to Drago and Wagner (2004), predisposed kinesthetic students have high energy levels, prefer to apply touch, movement, and interaction to their environment, and place a greater emphasis on experience and practice when learning something new. Armstrong (2004) emphasized that students with a kinesthetic learning style like to move and be active, learn physical skills quickly, like to think while they move, do well in athletics, use movement as a memory aid, and have good coordination in a variety of situations. Wolfman and Bates (2005) attested to this by stating that students' motivation to learn can be increased using a kinesthetic learning style.



Students' academic performance is a sign of a good learning environment. The display of learning outcomes, which can be assessed through performance, classroom tests, assignments, outputs, and major examinations, and the remarkable scores that students achieve across their subject courses are used to measure academic achievement. In recent decades, academic performance has been the focus of educational research. The study of performance has expanded beyond the straightforward issues of intelligence and previous academic performance to include how students interact with the material. Academic performance has been explained by a number of factors, including: intelligence (Deary, Strand, Smith, & Fernandez, 2007); demographic status (Ray, 2010); characteristics of behavior (Lane, Barton-Arwood, Nelson, & Wehby, 2008). Magulod (2019) investigated the preferences for learning styles, study routines, and academic achievement of students enrolled in applied science courses at a single campus of a public Philippine higher education institution. With a purposive sample of 75 respondents, the descriptive correlational research design was used in this study. The researcher utilized two standardized instrument sets. The study's findings revealed that students in applied sciences courses have moderate study habits and prefer visual, group, and kinesthetic learning styles. The difference test revealed that their perceptual learning styles were significantly different depending on their father's occupation, academic performance, and the kind of high school they graduated from. Nja et al. (2019) looked into how learning styles affected undergraduates' academic performance in Science Education at the University of Calabar, Nigeria. The visual, auditory, global analytical, impulsive, reflective, individual, and group models that were used in this study made up the learning model. The study was conducted using an expo facto design. The Cronbach's Alpha reliability coefficient was used, and a reliability coefficient 0.82 was calculated. The analyzed data showed that students' choices of learning methods varied significantly. Students' academic performance and learning styles were positively correlated. As a result, it was suggested that teachers use a variety of teaching strategies and methods to enable students to learn in a variety of ways. Ogbonna (2017) investigated learning styles as academic achievement predictors. The study was guided by two research questions and their corresponding hypotheses. 1269 students 627 males and 642 females, from public secondary schools in Rivers State, Nigeria, participated in the study. The study's sample was selected using a multi-stage sampling method. The study's data were collected using two reliable instruments: the Mathematics and English Achievement Test (MEAT) and the Visual, Aural, Read/Write, and Kinesthetic (VARK) questionnaire. At the .05 alpha level, the null hypotheses were evaluated. The study showed that students' learning



styles are statistically significant predictors of their academic success. Again, male and female students have very different ways of learning. The findings were used to make recommendations and draw conclusions. With implications for counseling, Bethel-Eke and Eremie (2017) investigate the learning styles and academic performance of junior secondary school students in Rivers State. The study was conducted using a correlational research methodology. The study utilized the stratified sampling method. In order to answer the research questions, the arithmetic mean was used, and the inferential statistic Pearson Product Moment Correlation was used to test the hypotheses at the 0.05 alpha level. The statistical analyses revealed a significant connection between students' academic performance and visual learning styles. Students' academic performance was also found to be significantly influenced by their auditory and kinesthetic learning styles. The study came to the conclusion that students' academic performance improves across all learning styles visual, auditory, and kinesthetic.

Though Nja Et Al. (2019) Looked Into How Learning Styles Affected Undergraduates' Academic Performance In Science Education At The University Of Calabar, Nigeria, Others Wose Studies Focused On Secondary Schools Found That Students' Choices Of Learning Methods Varied Significantly. Students' Academic Performance And Learning Styles Were Positively Correlated. The Previous Studies Documented That Learning Styles Were Significantly Affected The Students' Academic Performance In Nigerian Senior Secondary Schools.(Magulod, 2019; Ogbonna, 2017; Bethel-Eke And Eremie, 2017). However, most of the studies focused on the other States in Nigeria but non-has addressed the issues in South Eastern region of the country

Method

This study adopted the survey research design. The population of this study was senior students in the eleven secondary schools in Oji-River L.G.A. of Enugu State. Since it was difficult to reach the exact number of students in these schools, the researcher used purposive sampling technique to select a sample size of 473 from a population of 572 respondents. A structured questionnaire entitled learning styles and academic performance with a five point likert scale used for data collection. The response options were given as; Strongly agreed (SA), Agree (A), Undecided (Un), Disagreed (D) and Strongly disagreed (SD).



Results

Table 1: Summary of the responses

S/N	Questions	SA	A	Un	D	SD
1	Auditory learning provide listening learning	101	211	7	60	22
2	Hearing is major means of learning.	113	220	8	48	12
3	Dissemination of information is preferred	125	224	1	34	17
4	Instructions were used for learning.	99	208	7	63	8
5	Recordings and discussions are devises for learning	103	221	11	58	17
6	Practices of the learning process.	121	221	7	42	10
7	Demonstrations and case studies	105	235	11	38	12
8	It also involves movement and action;	100	240	9	41	11
9	Physical experience, touching and feeling	110	218	7	52	14
10	Simulations, videos emphasis and direct involvement is chosen	121	228	11	31	10

Source: field survey, 2022

Test of Hypotheses

Hypothesis One

Ho: auditory learning style has not enhanced academic performance of students in senior secondary schools in Oji-River L.G.A. of Enugu State.

Table 2: One-Sample Test

Questions	Test Value = 0			Mean Difference	95% Confidence Interval of the Difference	
	T	df	Sig. (2-tailed)		Lower	Upper
1	2.195	4	.093	80.20000	-21.2349	181.6349
2	2.020	4	.113	80.20000	-30.0231	190.4231
3	1.915	4	.128	80.20000	-36.0910	196.4910
4	2.246	4	.088	80.20000	-18.9366	179.3366
5	2.042	4	.111	80.20000	-28.8242	189.2242

From the Table 2, the test result shows that among the five questions raised on auditory learning style; auditory learning provide listening learning, hearing is major means of learning, dissemination of information is preferred, instructions were used for learning and recordings and discussions are devises for learning, only question three “dissemination of information is preferred” was not significant, hence the t-value was less than 2 (1.915). This implies that auditory learning style based on listening, hearing, spreading information, recording, discussion, taking instruction for academic performance in secondary schools. This study therefore accept alternative hypothesis



which uphold that auditory learning style enhances academic performance of students in senior secondary schools in Oji-River L.G.A. of Enugu State.

Hypothesis Two

Ho: Kinesthetic learning style does not affect academic performance of students in senior secondary schools in Oji-River L.G.A. of Enugu State.

Table 3: One-Sample Test

Questions	Test Value = 0		Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
	T	df			Lower	Upper
A	1.967	4	.121	80.20000	-32.9802	193.3802
B	1.896	4	.131	80.20000	-37.2650	197.6650
C	1.857	4	.137	80.20000	-39.7392	200.1392
D	2.057	4	.109	80.20000	-28.0685	188.4685
E	1.900	4	.130	80.20000	-37.0153	197.4153

From the Table 3, the test result shows that among the five questions raised on kinesthetic learning style; practices of the learning process, demonstrations and case studies, it also involves movement and action, physical experience, touching and feeling, simulations, videos emphasis and direct involvement is chosen, only question nine “physical experience, touching and feeling” was significant, hence the t-value was higher than 2 (2.057). This implies that though kinesthetic learning style based on practices, case studies, movement and action, physical experience, touching and feeling, and likes are for academic performance in secondary schools, physical experience, touching and feeling are most important and significant for academic performance. This study therefore accept alternative hypothesis which uphold that kinesthetic learning style enhances academic performance of students in senior secondary schools in Oji-River L.G.A. of Enugu State.

Conclusion

This study determined the extent learning styles has affected academic performance of senior secondary schools in Enugu State. A sample size of 478 respondents was used for the study and t-test was used as the statistical tool to test the hypotheses. Today’s teacher knows that the ways in which students learn vary greatly. Individual students have particular strengths and weaknesses which can be built upon and enhanced through effective instruction. It is possible to create products that reflect shallow and superficial thought.

The study revealed that auditory and kinesthetic learning styles enhance academic performance of students in senior secondary schools in Oji-River L.G.A. of Enugu.



Listening, hearing, spreading information, recording, discussion, practices of the learning process, demonstrations and case studies, movement and action, physical experience, touching and feeling, were among means of achieving academic performance using these learning styles. Nevertheless, the motivating factors associated with choice when individual learning styles are addressed in projects, suggest that teaching thinking skills in the context of individual learning styles increases the likelihood that students will learn them.

Recommendations

The study makes the following recommendations based on the preceding findings:

1. As a result, it was suggested, among other things, that teachers and instructors should consider the various learning styles of their students and devise instructional strategies that can accommodate these differences while remaining sensitive to them throughout the teaching process.
2. Additionally, teachers should assist students in identifying their preferred learning styles and use this information to cultivate lifelong learners.



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