

Relationship between Learning Styles and Mathematics Academic Achievement of Secondary School Students in Awka Education Zone

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Abstract: Academic achievement of students occupies a very important position in learning process, thus, understanding its relationship with student's learning style preference is an important consideration when designing classroom instruction. This study determined the relationship between learning styles and students' Mathematics academic achievement in Awka Education zone, Anambra State. The study adopted a correlational research design. A multi-stage sampling procedure was adopted and used in selecting a sample size of 1,241 students from a population of 6,279 students in public secondary schools. A validated questionnaire titled, Learning Style Questionnaire was used to collect data for the study. The questionnaire has reliability coefficient alphas of 0.68, 0.64 and 0.77 on each of the learning style cluster. The questionnaire was administered through direct delivery approach. Data was collected and analysed using percentages and Pearson Product Moment Correlation Coefficient. Findings from the study revealed among others that; there is very low negative relationship existing between the secondary school students' visual learning style and their achievements in Mathematics in Anambra State; there is very low negative relationship existing between the students' auditory and kinesthetic learning style and their achievements in Mathematics in secondary schools. Similarly, the findings revealed that the relationship existing between the secondary school students' visual, auditory and kinaesthetic learning style and their achievements in Mathematics is not significant. Based on the findings, the following recommendations among others were made that teachers should take into account their students 'diverse learning styles in order to design instructional methods that take care of those diversities and remain sensitive of such during the instruction process.

Keywords: Learning Styles, students, mathematics, academic achievement, relationship

I. INTRODUCTION

Academic achievement of students has often been used as a criterion to determine the outcome of teaching and learning. Hence, it is seen as a criterion to judge students' total potentiality and the extent to which the individual is likely to attain in life. Academic achievement of students also occupies a very important position in education, as well as in learning process. Thus, the issue of students achievement in school is thus important to many, including parents who care about their wards' academic achievement because they believed that good academic report will provide better career choice and subsequently, job security.

However, it has been observed that there is a decline in the standard of education in the country (Aremu, 2005). This decline tends to affect the overall academic achievement of secondary school students. As Okonkwo (2012) observed, it has remained on steady decline, especially core subjects like Mathematics and English Language thereby leading to an overall poor academic achievement among students in Nigeria.

Using the May/June 2017 secondary school certificate examination results for example, out of 1,471,151 candidates that sat for the examination and whose results were released, 923,486 candidates, representing 59.22 per cent, obtained credits in five subjects, including English Language and Mathematics (West African Examination Council, WAEC, 2017). Although the general performance is an improvement from the examinations pass rate in 2016, which stood at 52.97 per cent, however, the downward movement in the performance of states like Anambra which went from being in the second position in the preceded year to 6th position in the 2017 May/June examination.

This issue of poor academic achievement, especially in Mathematics and English Language among secondary school students in Anambra State has become a worrisome situation which ought not to be allowed to continue. This is because, while Mathematics is seen as the basis for modern scientific and technological developments, English language on the other hand is the main language used for official purposes in Nigeria, which perhaps, is the reason why parents and education authorities tend to put a great deal of pressure on their children to succeed in both subjects.

A, Four-year analysis of candidates' performance in West African School Certificate Examination in English Language and Mathematics in Anambra state, according to National Bureau of Statistics (NBS, 2015), showed that their performance has been on decline. Available data according to National Bureau of Statistics revealed that between the year 2011 and 2014, students' achievement record in English Language ranged between 34.9 and 39.7 percent, while that of Mathematics was between 14.6 and 22.6 percent.

Academic achievement refers to the results of intellectual performance in schools and is an educational parameter for measuring academic success. According to Steinmayr, Dinger

and Spinath, (2012), it is the most important factor for determining of students' success in the school settings. Academic achievement is the outcome of education, the extent to which a student, teacher or institution have achieved their educational goals. Academic achievement also represents performance outcomes that indicate the extent to which a person has accomplished specific goals that were the focus of activities in instructional environments, specifically in school, college, and university (Wilson, 2012).

Academic achievement as Okorie (2009) noted academic achievement could be considered to be a multifaceted construct that comprises different domains of learning and involves the school systems defining cognitive goals that either apply across multiple subject areas such as critical thinking or include the acquisition of knowledge in a specific intellectual domain which could be numeracy, literacy, science, and history. This is because the field of academic achievement is very wide-ranging and covers a broad variety of educational outcomes. More so, in view of Osisoma (2006) assertion, the researcher thus operationalized academic achievement in the context of this study to mean the achievement scores of students which indicates their intellectual performance in schools, using English Language and Mathematics as an educational parameter.

Several factors have been identified in explaining academic achievement: demographic status (Ray, 2010), intelligence (Deary, Strand, Smith, & Fernandez, 2007); behavioural characteristics (Lane, Barton-Arwood, Nelson, & Wehby, 2008); and psychological factors such as attributes (Erdogan, Bayram, & Deniz, 2008) Nevertheless, Hawkins (2012) noted that for any student to obtain a high academic achievement, that student need to have a good learning style. It is one concept in particular which has provided some valuable insights into learning in both academic and other educational settings.

Learning style is both a characteristic which indicates how a student learns and likes to learn, as well as instructional strategy informing the cognition, context and content of learning. Thus, learning styles according to Reed and Oughton, (2007) refer to how individuals prefer to organize and represent information. Learning style is thus connected to both a set of behavioural strategies in the way of managing and organizing the information, as well as the way of implementing those strategies.

Moreover, according to Dunn and Dunn (2012, the inability of schools and teachers to take account of individual learning preferences tends to produce endemic low achievement and poor motivation among students. In many cases, neither students nor teachers are aware that difficulty in learning may not rest solely in the material itself. This assertion was expounded by Domino (2010) whose study revealed that college students taught in their preferred learning styles scored higher on tests, fact knowledge, attitude and efficiency than those taught in instructional styles different from their preferred style. Mismatch of teaching styles and learning

styles therefore could actually have negative impact to students learning process.

Learning style thus is used to describe individual differences in the way people learn, as each person has a unique way to absorb and process experiences and information. The learning style considered in this study include; visual, audio-visual and kinaesthetic learning capability. Visual learners for instance are the type of learners that have strong visualization skills and can remember objects, shapes, and pictures. Hence they learn by reading, and by watching films, videos, and demonstrations. Visual earners like to learn through written language, such as reading and writing tasks. They remember what has been written down, even if they do not read it more than once. They like to write down directions and pay better attention to lectures if they watch them. Learners who are visual-spatial usually have difficulty with the written language and do better with charts, demonstrations, videos, and other visual materials. They easily visualize faces and places by using their imagination and seldom get lost in new surroundings.

Auditory learners on the other hand have a good sense of hearing and can hear differences in tones and rhythm. Hence they benefit more from reading out loud and can easily remember what they hear in the classroom. Auditory learners tend to benefit most from traditional teaching techniques. Many teachers use a lecture-style forum, presenting information by talking to their students. Regulating voice tone, inflection, and body language will help all students maintain interest and attention. Auditory learners succeed when directions are read aloud, speeches are required, or information is presented and requested verbally.

Kinesthetic learners on the other hand need to be physically active in doing things. They are hands-on learners, have good coordination and learn by doing. Kinesthetic learners are most successful when totally engaged with the learning activity. They acquire information fastest when participating in a science lab, drama presentation, skit, field trip, dance, or other active activity. Because of the high numbers of kinesthetic learners, education is shifting toward a more hands-on approach and manipulative approaches incorporated into almost every school subject, from physical education to language arts.

Previous studies such as Akinbobola (2015) and Ibeh (2015) have reported that students' learning performance could be improved if proper learning style dimensions could be taken into consideration when developing any learning or instructional process. Ibeh (2015) study suggested that students need to understand which learning style translates to their overall outcome in school. However, though various research efforts has been made in investigating factors that contributes to the students' academic achievement in schools, not much has been done in examining the relationship that exist among learning styles of secondary school students and their academic achievement in schools in Anambra state. This therefore has motivated this study.

Purpose of the Study

The main purpose of the study is to determine the relationship between learning styles (Visual, auditory and kinaesthetic) and Mathematics academic achievement of secondary school students in Awka Education Zone. Specifically, the study sought to determine:

1. The relationship existing between students’ visual learning style and their achievements in Mathematics in secondary schools.
2. The relationship existing between students’ kinaesthetic learning style and their achievement in Mathematics in secondary schools.
3. The relationship existing between students’ auditory learning styles and their achievement in Mathematics in secondary schools.

Research Questions

The following research questions guided the study:

1. What is the relationship existing between students’ visual learning style and their achievements in Mathematics in secondary schools.
2. What is the relationship existing between students’ kinaesthetic learning style and their achievement in Mathematics in secondary schools.
3. What is the relationship existing between students’ auditory learning styles and their achievement in Mathematics in secondary schools.

Hypotheses

The following null hypotheses will be tested in the study, at 0.05 level of significance

1. The relationship existing between students’ visual learning style and their achievements in Mathematics in secondary schools will not be significant.
2. The relationship existing between students’ kinaesthetic learning style and their achievement in Mathematics in secondary schools will not be significant.
3. The relationship existing between students’ auditory learning styles and their achievement in Mathematics in secondary schools will not be significant.

II. METHODOLOGY

Research Design

The researcher adopted a correlational research design. . A correlational design is considered appropriate for this study because the study sought to establish a relationship between variables; learning styles and academic achievement of secondary school students.

Area of the Study

This study was carried out in Awka education zone, Anambra State. Anambra State is a state in Southern Nigeria. The state comprised of six education zones of which Awka Education Zone is one of them. The zone also has the highest number of public secondary schools in the State.

Participants

The sample for the study consist of 1, 260 students. This comprise of all the SS2 students that were chosen from government owned secondary schools in Awka Education Zone, through a multi-stage sampling method.

Instrument for Data Collection

The instrument for data collection consists of questionnaire titled “Learning Style Questionnaire”. This is an adapted version of the modality (learning channel preference) questionnaire initially developed by O’Brien (1985) and tailored to suit the purpose of this study. The instrument is a 24 item questionnaire describing characteristics of Visual, Auditory, and Kinesthetic learning styles. There are 8 items measuring each style. The questionnaire has response options of Always, Sometimes, Rarely, and Never, with weighted values of 4, 3, 2 and 1 respectively. The modality type with the highest score indicates the students’ preferred learning channel; the higher the score, the stronger the preference. The internal consistency reliability of the instrument was determined; yielding a coefficient alpha of 0.94 for the Learning Style Questionnaire. This was determined using Cronbach alpha statistical method.

Data Collection and Analysis

The researcher administered 1, 260 copies of the instruments through direct delivery method. The administered questionnaire after collection were scored in line with the instrument scoring guide and analysed using statistical package for social science (SPSS). Pearson Product moment correlation coefficient (Pearson r) was used in answering research questions and test for the hypotheses.

III. RESULTS

In this section, the data collected from the field for this study were analysed and the summaries presented in tables to highlight the findings as follows:

Research Question 1

What is the relationship existing between students’ visual learning style and their achievements in Mathematics in secondary schools?

Table 1: Pearson r on students’ visual learning style and their achievement scores in Mathematics

Source of Variation	N	Visual learning style r	Achievements r	Remark
Visual learning style	1241	1.00	-0.030	Very Low Negative

Relationship Achievements	1241	-0.030	1.00	
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Table 1 shows that there is very low negative relationship of -0.030 existing between the students’ visual learning style and their achievements in Mathematics in secondary schools.

Research Question 2

What is the relationship existing between students’ auditory learning style and their achievements in Mathematic in secondary schools?

Table 2: Pearson r on students’ auditory learning style and their achievement scores in Mathematics

Source of Variation	N	Auditory learning style r	Achievements r	Remark
Auditory learning style	1241	1.00	-0.016	Very Low Negative
Relationship Achievements	1241	-0.016	1.00	

Table 2 reveals that, there is very low negative relationship of -0.016 existing between the students’ auditory learning style and their achievements in Mathematics in secondary schools.

Research Question 3

What is the relationship existing between students’ kinaesthetic learning style and their achievements in Mathematic in secondary schools?

Table 3: Pearson r on students’ kinaesthetic learning style and their achievement scores in Mathematics

Source of Variation	N	Kinaesthetic learning style r	Achievements r	Remark
Kinaesthetic learning style	1241	1.00	-0.008	Very Low Negative
Relationship Achievements	1241	-0.008	1.00	

Table 3 reveals that, there is very low negative relationship of -0.008 existing between the students’ kinaesthetic learning style and their achievements in Mathematics in secondary schools.

Testing the Null Hypotheses

Null Hypothesis 1

The relationship existing between the students’ visual learning style and their achievements in mathematics in secondary schools is not significant.

Table 4: significant of Pearson r on the students’ visual learning style and their achievements in mathematics using probability table of r

N	cal. r	df	pvalue	Cal. pvalue	Remark
1241	-0.03	1239	0.05	0.285	NS

NS = Significant

Table 4 shows that at 0.05 level of significance and 1239df, the calculated r -0.030 has pvalue 0.285 which is greater than critical pvalue 0.05. Therefore the fourth null hypothesis is accepted. The relationship existing between the students’ visual learning style and their achievements in mathematics in secondary schools is not significant.

Null Hypothesis 2

The relationship existing between the students’ auditory learning style and their achievements in mathematics in secondary schools is not significant.

Table 5: significant of Pearson r on the students’ auditory learning style and their achievements in mathematics using probability table of r

N	cal. r	df	pvalue	Cal. pvalue	Remark
1241	-0.016	1239	0.05	0.581	NS

NS = Significant

In table 5, it was observed that at 0.05 level of significance and 1239df, the calculated r 0.016 has Pvalue 0.581 which is greater than critical Pvalue 0.05. Therefore the fifth null hypothesis is accepted. The relationship existing between the students’ auditory learning style and their achievements in mathematics in secondary schools is not significant.

Null Hypothesis 3

The relationship existing between the students’ kinaesthetic learning style and their achievements in mathematics in secondary schools is not significant.

Table 6: significant of Pearson r on the students’ auditory learning style and their achievements in mathematics using probability table of r

N	cal. r	df	pvalue	Cal. pvalue	Remark
1241	0.008	1239	0.05	0.786	NS

NS = Significant

Table 6 reveals that at 0.05 level of significance and 1239df, the calculated r -0.008 has pvalue 0.786 which is greater than critical pvalue 0.05. Therefore the sixth null hypothesis is accepted. The relationship existing between the students’ kinaesthetic learning style and their achievements in mathematics in secondary schools is not significant.

IV. DISCUSSIONS

The findings of the study are hereby discussed.

Relationship between the Students’ visual learning style and the academic achievement in Mathematics

Findings of the study revealed there is very low negative relationship existing between the students’ visual

learning style and their achievements in Mathematics in secondary schools. What this finding is pointing to is that there is an inverse relationship between the students' visual learning style and their academic achievement in school. This means that, the more the students adhere to visual learning style, the less they are likely to achieve in mathematics. However, this may not really be the case, as there are other contributory factors to students' achievement in schools as noted by Robotham (2012) which may not have been covered within the scope of this study. According to Robotham, factors such as organizational settings of students' environment during the instruction, which may include lighting of the room, temperature, sound level, time of the day or seating arrangement, are some of the notable factors.

Furthermore, findings of the study revealed that the relationship between the students' visual learning style and their academic achievements in mathematics in secondary schools is not significant. This means that the linear relationship is close to nonexistent. This finding is in agreement with Vaishnav (2013) whose study reported that there exist a negligible correlation between visual learners and academic achievements. This shows that although visual learning styles may be a contributory factor in academic achievement of students in secondary schools, it may not really have contributed much to students' achievement in both English language and Mathematics in Anambra State as observed this study.

Relationship between the Students' Auditory Learning Style and the Academic Achievement in Mathematics

Findings of the study revealed that there is very low negative relationship between the students' auditory learning style and their achievements in Mathematics in secondary schools. What could be inferred from this is that both the auditory learning style and the student's academic achievement in Mathematics do not necessarily move in the same direction. So the learning style alone may not be responsible for the students' academic achievement in Mathematics as observed among the secondary school students in Anambra State.

The findings of the study further revealed that the relationship existing between the students' auditory learning style and their achievements in mathematics in secondary schools is not significant. This also indicated that though there is negative relationship between auditory learning style and academic achievement of the students, the relationship is insignificant. There could be many reasons for this finding, among which is that the learning style alone may not be sufficient for academic achievement in mathematics. Again, it is also possible that other factors which were not addressed in this study may be at play.

On the other hand, it could be that the students are not adopting the required strategy that would enable them make effective utilization of the learning style in Mathematics. According to Wadsworth, Husman and Duggan

(2007) and, Zimmerman and Schunk (2011), a good strategic learner must understand how to identify their learning goal, integrate the learning style, apply proper skills, and be self-regulatory to achieve the best results from learning. Perhaps if the students are taught to embrace this approach, it is possible that it could make a difference in their academic achievement, especially in core subjects like Mathematics.

Relationship between the Students' Kinaesthetic Learning Style and the Academic Achievement in English Language and Mathematics

Findings of the study revealed that there is very low negative relationship existing between the students' kinesthetic learning style and their achievements in Mathematics in secondary schools. This means that the more the students learning style is tilted towards kinesthetic, the less they are likely to achieve academically in Mathematics. Furthermore, the relationship existing between the students' kinesthetic learning style and their achievements in mathematics in secondary schools is not significant. This finding surprisingly is not consistent with the findings of previous researchers such as Vaishnav (2013) which reported high positive relationship between learning style and students' academic achievement in Mathematics. The reason for this finding could be attributed to other factors such as age, educational level, and motivation as well as situational factors, such as the type of the class or the subject being studied, which according to Brown (2013) ought to be taken into consideration.

V. CONCLUSIONS

Based on the findings of this study, it was concluded that the relationship existing between the students' visual, auditory and kinesthetic learning styles and their achievements in mathematics in secondary schools was not significant.

VI. RECOMMENDATIONS

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

1. Teachers should take into account their students 'diverse learning styles, design instructional methods that take care of those diversities and remain sensitive of such during the instruction process. They should also help their students to understand their learning style preferences and make use of such to develop life-long learners.
2. Guidance counsellors should collaborate with classroom teachers to identify the individual differences in the learners and associate them with their learning styles in order to discover the appropriate teaching method that will complement the learners' style.

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