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IMPACT OF COGNITIVE STYLES OF LEARNING ON STUDENTS' ACADEMIC ACHIEVEMENT AND INTEREST IN SENOR SECONDARY SCHOOL MATHEMATICS IN OBOLLO AFOR EDUCATION ZONE OF ENUGU STATE

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ABSTRACT

The study examined the impact of cognitive styles of learning on students' academic achievement and interest in senior secondary school mathematics in Obollo Afor education zone of Enugu State. Two research questions and two hypotheses guided the study. The participants were 382 (186 males and 196 females) students drawn from the ---- public secondary schools across the education zone. The study adopted quasi-experimental research design which is capable of showing the relative effects of variables in the study. The instrument used in data collection was Mathematics Achievement Test (M.A.T). the instrument was subjected to validity and reliability and found to be reliable at Cronbach Alpha coefficient of 0.83. Mean and standard deviation were used to answer the research questions while analysis of covariance (ANCOVA) was used to test the hypotheses at 0.05 level of significance. The findings showed that cognitive styles of learning enhance students' interest in learning mathematics thereby improving their academic achievement. The study thus, concludes that students with good knowledge of cognitive styles of learning will develop adequate interest in mathematics learning and improved academic achievement. Recommendations were made that curriculum planners should endeavour to make cognitive styles of learning part of the teaching techniques for secondary school mathematics teachers.

Keywords: Cognitive styles, Academic Achievement, Interest, Mathematics, Gender.

Introduction

Academic achievement is usually measured through examination or continuous assessment. It indicates the extent to which a student has achieved their learning objectives positively or negatively. Academic achievement is a phenomenon that is affected by a lot of factors which include interest, phobia, methods of teaching and learning, genders etc in Nigeria today, mathematics is a compulsory subject in primary and secondary schools and students must obtain at least a credit pass in WAEC or NECO examinations as a basic requirement for admission into higher institution in Nigeria. Besides, the achievements of students in Mathematics had continuously been a challenge. In the WAEC result of May/June 2022, out of the 317,997 students who registered for the examination across the nation, only 39.34% of the students obtained at least a credit pass

(WAEC chief examiner report, 2022). This is worrisome and calls for continual effort in research to see to if that achievement of students in mathematics is improved upon.

Academic achievement is commonly measured through examination or continuous assessment but there is no general agreement on how best it will be evaluated or which aspect is most relevant. Furthermore, there are inconclusive results over which individual factors successfully predict academic achievement, Tembe (2020) attributed such elements as test anxiety, environment, motivation, emotions, interest and self-concept among other required consideration when developing models of school achievement. Mathematics achievement is an essential part of the academic achievement in the modern era. It is the key to success in many areas of life. Mangal (2018) stated that " an achievement test is essentially a tool of measurement that enables someone ascertaining the quantity and quality of learning attained in a subject of study or group of subjects after a period in institution by measuring the present ability of the individual concerned. Academic achievement is the competency shown by the students in mathematics. It is the outcome of acquired knowledge or information, understanding, skills and techniques developed in the subject of mathematics in a particular stage. Its measure is the score on the achievement test in mathematics.

Kumar (2017) stated that, teachers and school administrators can measure student's academic achievement through school-wide standardized test, state-specific achievement tests and classroom assessment. David (2016) stressed that academic achievement is the student's success in meeting the short or long-term goals in education. They are of the opinions that demonstration of students' abilities to attain certain levels of instructional objectives outcome of their classroom instruction and experience is achievement. Students' achievement in mathematics has always been a matter of concern to educational stakeholders because whatever students tend to be and the nation at large is deformed by the success of the student in academic success. This could explain the reason why there is so much campaign on the improvement of student's achievement in mathematics by examination bodies such as WAEC, NECO and so on.

Students' achievement could either be low or high, it is low when the students do not attain up to the desired expectation or benchmark of the instructor and it is high when the performance of the learner is exactly or above the desired outcome of the instructor. So many factors could be responsible for low or high achievement in mathematics. Some of these factors include teachers' factor, school factor, parent factor, government factor, interest and cognitive styles of learning. Asikhia (2019) stated that if all these factors are improved, students will surely perform better in their mathematics examinations. This implies that if student's achievement in mathematics will be improved upon there must be continuous investigation of various factors so as to ascertain new and innovative ways of learning and teaching mathematics. A student with high individual interest would be characterized by a consistently high

cognitive commitment and emotional attachment to a specific (scholastic) domain. In that sense, interest is considered as domain-specific, cognitive and an effective component, that is built and nourished over the school career, and is assumed to be relatively stable over a variety of situations and over time. Mathematics interest is a complex behavioural aspect of mathematics. It has so many characteristics and it can be attributed to as many situations as we discuss in mathematics education. The key strategy of mathematics teaching should focus on keeping the students interest on mathematics. If the students have interest in learning mathematics that should be helpful to their academic achievement and also teacher tasks become easier. Therefore interest and cognitive styles are very important factors to consider in the teaching and learning processes.

In a study, Unodiaku in Anigbo (2016) on associated factor of academic achievement among secondary school students in mathematics attributed it to lack of interest and inadequate use of cognitive styles. Also, in a study on interest in mathematics and academic achievement, Mohanned and Charles (2017) found that there is a significant difference in interest and academic achievement of secondary school students in respect of the type of management. Nozari and Siamian (2015) attributed it to adequate use of cognitive style, interest and frequent usage of other teaching methods. Sharma *et al* (2018) revealed a study on "relationship of cognitive styles with academic achievement among secondary school students and attributed it to adequate use of cognitive styles in teaching and learning process. Thus, success or failure in teaching and learning is been determined by academic achievement. Nzegwu (2018) opined that academic achievement is very important in any educational setting, as it indicates the level of students' competence in respect of the academic context. This shows that academic achievement is defined in terms of performance and grades which represent the most clear and universally accepted indicator of academic achievement in educational contexts. Fan *et al* (2016) defined academic achievement as competencies, knowledge, skills and attitude developed by students through active participation in teaching and learning activities. Korkmaz and Tay (2016) emphasized that academic achievement is the learning ability of students in relation to behavior, skills, knowledge, aptitude, value and attitude which must be permanent and of the interest of the students. Interest in learning is a teaching that accompanies or causes special attention to something or someone. Mohammed and Charles (2017) saw interest in mathematics learning as a complex behavioural aspect of mathematics. Wu et al (2019) defined interest as anything that is generally considered to be the product of interactions between an individual and his environment. Fallen an postal (2016) stressed that academic success requires a strong academic success requires a strong academic success requires a strong academic interest that motivates the individuals cognitive abilities.

However, Tembe (2020) highlighted the role of interest as it boosts motivation, and content specific activities. It is a

powerful driving factors that triggers and promote learning and is considered essential for academic success or failure. Hyde et al (2016) stated that parents can promote interest, as well as customize utility value information on an individual basics parent know their childs' interests and make specific persona connectives in a way that teachers who work with multiple studies cannot. This interest in this work is seen as a propelling force that motivates an individual to learn in order to make academic success. However, students who develops more interest in learning any subject is likely to increase his cognitive abilities which enhance his learning ability and increasing the level of his academic achievement, whereas student who reduces his interest in learning any subject end up getting low academic achievement. Another variable that is related to academic achievement is gender. Gender is defined as how individuals are classified as man or woman, girl or boy. Some scholars believes that the success or failure of student in any subject is been measured or determined by gender, while other scholar oppose.

Interest in learning has a direct connection with cognitive styles as the individuals' cognitive styles influence the type of interest one develops to make academic success or failure.

Sharma *et al* (2018) revealed that there is a relationship of cognitive styles with academic achievement among secondary school students and attributed it to adequate use of cognitive styles in teaching and learning. Adebisi (2015) have blamed our educational system in this poor academic achievement that is been faced in our country attributing these poor outcome as a result of lack of facilities, poor financing, lack of qualified teachers, improper use of teaching methods, parental insensitivity to their children's education and student's self esteem. Relationship between cognitive styles of learning, academic achievement and interest in senior secondary school mathematics had no definitive conclusion as some research findings report positive correlation, some found negative correlation, while others reported no relationship and grade differences in learning. This disparity of findings and views of various scholars leads to this gap which the study aimed at determining the relative effect of cognitive styles of learning on students' academic achievement and interest in senior secondary school mathematics in Enugu State.

Based on this background, it found that there was no study that looked at the impact of cognitive styles of learning on students' academic achievement and interest in senor secondary school mathematics in Obollo Afro education zone of Enugu State, thereby creating a gap that this study filled. Therefore, this study filled the existing gap by investigating the impact of cognitive styles of learning on students' achievement and interest in senior secondary school mathematics in Obollo Afor education zone of Enugu State.

Specially, the study sought to;

1. What is the impact of cognitive styles on interest of senior secondary school students in mathematics in Obollo Afor education zone of Enugu State?

2. What are the mean academic achievement scores of male and female students in mathematics?

Hypotheses

The following null hypotheses were formulated and tested at 0.05 level of significance.

Ho_1: There is no significant difference in the mean interest ratings of senior secondary school students taught mathematics using cognitive styles in Obollo Afor education zone of Enugu State.

Ho_2: There is no significant difference in the mean academic achievement scores of male and female students in mathematics in Obollo Afor education zone of Enugu State.

Research Method

This study adopted quasi-experimental research design. Nworgu (2015) defined quasi experimental design as a research design that established cause and effect relationships. This design is considered to be appropriate for the study because it examines cause and effect relationships. The population of the study was 15,000 SSII students in the education zone. Purposive sampling was used to select 382 students (186 male and 196 females) in three public secondary schools in the zone. Two research questions and two hypotheses guided the study and were validated by experts. Mean and standard deviation was used to analyze the data collected while Cronbach alpha coefficient of 0.83 (ANCOVA) was used to test the hypotheses.

Presentation of Results

Research Question One: What is the impact of cognitive styles on interest of senior secondary school students in Mathematics in Enugu State?

Table 1: Mean and Standard Deviation of Pretest Posttest of the effect of cognitive styles on interest of senior secondary school students in Mathematics in Enugu State

		Pre test		Posttest		
Cognitive Styles	**N**	$\bar{X}$	**SD**	$\bar{X}$	**SD**	**Mean gain**
Field Dependent	200	29.67	4.38	43.23	4.83	13.56
Field Independent	182	28.43	5.87	31.53	5.35	3.10

Result of the study in Table 1 showed that students who were taught Mathematics using field dependent (FD) cognitive style had mean interest ratings of (= 29.67, SD = 4.38) at the pretest and mean interest rating of (= 43.23, SD = 4.83) at the posttest level while the mean gain score was 13.56. Similarly, students taught Mathematics using field independent (FI) had mean interest ratings of (= 28.43, SD = 5.87) at pretest and mean interest ratings score of ($\bar{X}$ = 31.53, SD = 5.35) at posttest with a mean gain score of 3.10. Meanwhile,

the higher gain score of 13.56 for FD showed that FD cognitive style improved students' interest in Mathematics more than FI.

Research Question Two: What are the mean academic achievement scores of male and female students in Mathematics?

Table 2: Mean and Standard Deviation of the mean academic achievement scores of male and female students in Mathematics

		Pre test		Posttest		
Gender	**N**	$\bar{X}$	**SD**	$\bar{X}$	**SD**	**Mean gain**
Male	186	47.08	6.54	62.17	6.07	15.09
Female	196	46.29	6.61	60.93	5.42	14.64

Result in Table 2 showed the mean academic achievement scores of male and female students taught Mathematics. Result shows that the male students had mean academic achievement score of 47.08 with standard deviation of 6.54 at pre-test and 62.17 with standard deviation of 6.07 at post-test. The mean gain score of male students was 15.09. On the other hand, the female students had mean academic achievement score of 46.29 with standard deviation of 6.61 at pre-test and 60.93 with standard deviation of 5.42 at post-test. The mean gain scores of the female students was 14.64. The result showed that the male students showed greater academic achievement in Mathematics than the female students.

Discussion

Table 1 indicated that there were significant differences in the mean achievement scores of students taught Mathematics using FI and FD in favour of the FI. Thus, students taught Mathematics using field independent had a higher mean achievement compared to field dependent. The findings of this study lay credence to Ayodele (2018) who documented that cognitive styles enhanced achievement test performance of students significantly. It is coherent with Zollman and Robert (2018) who found that the use of cognitive styles significantly improved students' achievement in Mathematics.

The findings of the study with respect to research question two and the corresponding hypothesis two showed that FD cognitive style improved students' interest in Mathematics more than FI; and there is no significant difference in the mean interest ratings of students taught Mathematics using cognitive styles. Table 2 indicated that field dependent was more efficacious in enhancing students' interests in Mathematics than the field independent. Also data on Tables revealed that there were significant differences in the mean interest scores of students when taught Mathematics using field dependent and field independent in favour of the field dependent. Thus, students taught Mathematics using field dependent had a higher mean interest score

compared to those taught using field independent. The findings of this study is in support of Mandal et al (2018) who documented that students taught mathematics using field dependent using cognitive style have more interest mean score than those taught without other kinds of cognitive styles. It agrees with Vozan & Saamian (2015) who reported that students taught education political science using cognitive styles have higher interest mean score than those taught education political science without cognitive styles. The relative efficacious strength of cognitive styles across different social science subjects indicates that when appropriately used in the teaching and learning cognitive related issues students' interest would be aroused.

The findings of the study with respect to research questions and the corresponding hypothesis showed that the male students showed greater academic achievement in Mathematics than the female students; and there is no significance difference in the mean academic achievement scores of male and female students in Mathematics. Data presented on showed that male and female students had almost equal achievement in Mathematics when exposed to cognitive styles with students in field dependence having higher mean achievement scores. Result of corresponding hypothesis revealed that there was no significant difference in the mean achievement scores of male and female students taught Mathematics cognitive styles. In line with the findings of the study Usman et al (2019) documented that there is no significant difference in the achievement mean score of male and female students taught Population Education using cognitive styles.

Conclusion

The study has established that the impact of cognitive styles of learning on students' academic achievement and interest in senior secondary school mathematics have a strong influence on students' understanding and learning of mathematics.

Recommendations

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

1. Curriculum planners should include cognitive styles of learning as part of mathematics teaching techniques in secondary schools in Nigeria.
2. Teachers should make adequate use of cognitive styles of learning during teaching and learning processes in the classroom settings.
3. Students are to be motivated in order to increase their interest in learning mathematics especially when they understand the need/important of mathematics in their lifetime.

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