



Cognitive Styles and Academic Performance of Senior Secondary School Students in Ogun State, Nigeria

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ABSTRACT The study investigated the joint and relative contributions of four predicting variables in predicting academic performance among secondary school students. The research design was descriptive survey while the study made use of 200 SS2 students chosen purposively from five secondary schools in Ijebu-Ode Local Government area of Ogun State, Nigeria. The two different instruments used for data collection were the accommodator cognitive style questionnaire and converger cognitive style questionnaire (ACSQ and CCSQ). Data were analysed using multiple regression. The results indicated an F value of 4.34 at a significant level of 0.05 which indicated that the four predictors could be used to predict the academic performance of students. Beta coefficients value for converger, accommodator, gender and area of specialisation were .014, .028, -.045, and .279 respectively. The study has implications for teachers, students, counselors, school authorities, parents and the government.

INTRODUCTION

Secondary education in Nigeria has persistently experienced one form of problem or the other, particularly in relation to students' general poor performances. This is supported by the observation of Owoyele (2012) that recently, secondary school adolescents in Nigeria have performed poorly and this has made educational managers and other stakeholders in Nigerian education to be more worried. This problem is confirmed by the poor performances of students who sat for examinations in different school subjects conducted by the West African Examination Council (WAEC). For instance, as observed by Adesulu (2012), 1,160,561 candidates which is less than 25 per cent had a credit pass in Mathematics across the country and only 1,695,878 million candidates which is only 38.81 per cent of those that sat for the May/June 2012 WAEC, obtained a credit pass in mathematics. Forthwith, Odeh et al. (2012) while referring to World Bank Report (2004), noticed that among Nigerian students, performance in English has not only been very poor over the years but Nigerian students performed below students in twenty-six other African countries. However, according to

a report given by Ojigeogu in the January 14, 2017 Vanguard newspaper, students that obtained five credits and above in English Language and mathematics was 31.28 percent and 38.68 percent in 2014 and 2015 respectively. He observed that this change was as a result of good reading habits and that this should be encouraged among students. Meanwhile, Bala in the same Vanguard newspaper report (2017) noted that the poor performance experienced by most students is as a result of inadequate preparation as many of them prefer watching films and engaging in online chatting instead of studying. These findings and many more necessitate the need for a study to find out whether today's students are not performing well because they lack healthy brain capacity to organise and process information to deal effectively with academic tasks or whether their poor academic performance is due to poor study habits.

Moreover, although Nigerian educators and policy makers have attempted to restructure public education with new curricular framework, new content standards and changes in educational policies, few of these efforts focus on learner centred approach to learning as they emphasise more of programmes and services in terms of the performance of potential students. In addition, educational managers are progressively realizing the importance of learning and

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that understanding the way individuals learn is the key to improving the educational system. Singh (2017) confirms this concern by stating that the intellectual capacity of citizens affects the nation's progress and as such, identifying learners' talents and providing them with relevant opportunities will enhance their capacities as well as higher academic achievement. Thus, the influence of cognitive style on academic performance is the major reason for studying it so often. Sankar and Raju (2011) define cognitive styles as the psychological differences that exist in the way people obtain information. These show how students understand, relate with and react to different learning environments. Similarly, Vikas (2017) see cognitive style as a term used in cognitive psychology to explain the way information is understood, perceived and remembered. This means that there is a way an individual understands information that aids remembrance of such information.

Generally, a number of researches revealed that cognitive style have either positive or negative relationship with learning. For instance, related studies like those of Bailey et al. (2000), Orhan (2012), Rahmani (2012), Tabatabaei and Mashayekhi (2012) and Williams et al. (2013) showed how cognitive style and Academic performance are significantly related. However, some other studies like those of Yilmaz-soylu and Akkoyunlu (2009) and Gebru et al. (2015) did not show such significant relationships. Thus, because of the varied research findings on the relationship between cognitive styles and students' academic performance and the importance of academic success to students' education, there is a need for more research in this area. It is therefore contended that the need to assist in improving the academic performance of learners in Nigeria and many other developing countries provided the basis for creating hypotheses for the study.

Research Objectives

This research focused on finding the relationship between cognitive style and academic performance of learners in Ogun State, Nigeria. Based on existing literature, this study assumed that the academic performance of learners is

affected by how they learn. However, this study specifically found out how cognitive styles and the academic performance of science and art students are related using the McCarthy's (1980) abstract/concrete cognitive style model. Hence, this research focused on the extent to which accommodators cognitive style predict academic performance among senior secondary school students and the relationship between convergers' cognitive style and senior secondary school students' academic performance. The objectives of this study therefore were to find:

1. The extent to which accommodator, converger, area of specialisation and gender factors predict academic performance among secondary school II students
2. How each of the independent variables (accommodators, convergers, gender and area of specialisation) predict secondary school students' academic performance.

Research Questions

The research questions addressed in this study are as follows;

1. To what extent will accommodator, converger, area of specialisation and gender factors predict academic performance among secondary school II students?
2. To what extent will each of the independent variables (accommodators, convergers, gender and of specialisation) predict academic performance among secondary school students?

Review of Related Literature

Concept of Cognitive Style

Descriptions of cognitive styles according to educational psychologists include characteristics, strengths and preferences in the way people receive and process information (Allinson and Hayes 1996). It refers to a fairly fixed characteristic of an individual which are static and relatively in-built features of the individual (Riding and Rayner 1998). Also, according to Bhatti and Bart (2013), cognitive styles are characteristic ways of perceiving and processing information. Olu-dipe (2014) also defines it as the process of perceiving, organising and interpreting information.

It can therefore be defined as an individual's relatively permanent and characteristic predispositions of perceiving, remembering, organizing, processing, thinking and problem solving that will affect what the individual has learnt over a period.

Cognitive style, according to Singh (2017) is also described as stable preferences, attitudes or habitual strategies which explain how an individual perceives, remembers, thinks and solves problems. All the above definitions show that cognitive style is the way individuals consistently perceives, remembers, organizes, processes, thinks and solves problems. It is therefore, the aim of this study to consider the implications of the accommodator and converger types of cognitive style for learners and to see the need for students' cognitive style in the educational system.

McCarthy's (1980) Synthesis of Cognitive Styles

This is one among several theories that emerged in education and psychology on the strategies used by learners to process information in their learning experiences. McCarthy divides cognitive styles into four types which are convergers, accommodators concrete and assimilators. According to her, convergers are often solid abstract thinkers who process information actively. These types of learners are self-reliant and tolerant of difficulties. They have abilities to deal with stress and are typically near the top of their arousal curves. They easily see alternatives to problems and emotionally do not have difficulty with taking responsibilities and expressing high self-concept. Their greatest strength is in the way they apply ideas practically and their educational backgrounds are often in technology and the physical sciences. Thus, the types of occupation they often engage in are engineering and computer science.

One of the major characteristics of Assimilators is abstract conceptualization and reflective observation. They have capacity to create theoretical models by reasoning inductively which is their greatest strength and natural (basic) sciences such as physics, chemistry, biology, astronomy and mathematics often their educational backgrounds. Accommodators on the other hand use concrete experience and active experimentations. They often engage actively with the world and do things by themselves rather than merely reading and studying about them.

They mostly engage in doing things, carrying out plans and experiments and having new experiences. The kind of educational backgrounds they often have is practical fields such as business, marketing, sales, finance, accounting, education and communication.

Divergers tend toward concrete experience and reflective observation. They are imaginative and are good at creating ideas and seeing things from different perspectives. Imaginative ability is their greatest strength and their educational backgrounds are often in social sciences or humanities (history, political science, language, sociology, economics, philosophy, etc.) and liberal arts. Counselors, organizational development consultants, and personnel managers often have this learning style.

Studies on Cognitive Style and Academic Performance

There are large numbers of research investigations on students' cognitive style that indicates its relationship with students' academic performance (Hayes and Allinson 1998; Kolb and Kolb 2009; Matthews 1996; Rasmussen 1998; Riding and Grimley 1999; Ross and Schultz 1999; Snyder 2000; Tinajero and Paramo 1998; Zhang and Sternberg 2006; Bhatti and Bart 2013; Zroohangiz et al. 2014; Singh 2017; Yazici 2017). Dunn and Dunn (1989), reviewed fifteen different studies and in thirteen of them, positive correlations between cognitive styles and students' performance were found. In addition, Dunn et al. (1995) conducted a meta-analysis based on the learning styles model developed by Dunn and Dunn, and their findings support the theory that students taught according to their cognitive styles consistently achieve at higher levels than those who are not.

Also, Matthew (1996) who used the Kolb learning styles inventory found that students with converger cognitive styles made up the smallest percentage of all students but graded themselves highest on the perceptions of their own academic performance compared to all other students while divergers rated themselves lowest on their perceptions of self-performance. Similarly, the study of Naqvi and Naqvi (2017) on learning styles, gender and academic performance of post graduate management students in India showed that the distribution of learning style type preference of the cho-

sen sample of students was more concentrated towards assimilating and converging styles. Another study by Cakiroglu (2014) also showed significant relationships between the students' learning styles, study habits, and performances in online learning. The results of the study further showed that the divergers and accommodators styles were associated with higher learning scores in synchronous settings.

However, Altun and Cakan (2006) in their study on the relationship between students' academic achievement, cognitive style and attitude towards computer science, found no relationship between cognitive style and academic performance. Similarly, the studies of Yilmaz-soylu and Akkoyunlu (2009) and Gebru et al. (2015) showed that there was no significant relationship between cognitive style and Academic performance. Results from the study of Gappi (2013) also showed that there was no significant effect of gender, age and academic program on the cognitive style preferences of the students. In addition, the studies of Jilardi et al. (2011) found that there was no significant difference between the cognitive styles and academic performance of students with converging, diverging, accommodating and assimilating cognitive styles.

In the same vein, the studies of Soghra et al. (2013) showed that performance in English score significantly and negatively correlated with learning styles of accommodating, assimilating, and positively with converging, but not significantly correlated with diverging and that Post-hoc Turkey's HSD tests showed that three comparisons were significant as subjects with preferred learning styles of assimilating were significantly better than accommodating and converging, and also that diverging was better than accommodating style in English test. The studies of Zroohangiz et al. (2014) showed that university students with convergent cognitive style have better performance than other groups and that cognitive style had a relationship with age, gender, field of study, semester and job. In contrast, Yang et al. (2012) showed that academic achievement of students who were converges was significantly higher than those who were diverges and accommodators. The findings of Gohar and Sadeghi (2014) show that converger learning style represent the highest proportion of the dominant 4-category learning styles preferenc-

es (62.60%), followed by assimilator learning style (17.89%), accommodator learning styles (11.38%), and diverger learning styles (8.13%). The students' inclination towards converging and assimilating learning styles implies that they prefer the practical application of opinions with little emotion, judgment and development of theories and abstract notions.

Cognitive Styles, Disciplinary Differences (Science and Art) and Academic Performance

In a study conducted by Nilson (2010), results showed a preference for many types of experiences, practical sessions, investigations, demonstrations, and problem solving by convergers. This agrees with the findings of Malcom (2009) who showed that the greatest strength of convergers is in the practical application of ideas. Similar finding was found by Thain et al. (2011) who suggested that no matter the type of teaching method is used, understanding a student's cognitive style is necessary in providing a successful learning experience, Biglan (1973) also found that while convergers had a direct tendency to achieve at higher levels in certain business classes, divergers showed an inverse tendency to achieve. However, this finding is related to a study of second year college accounting students and the courses they took that applied to their majors. The study of Wieseman (1992) on the relationship between students' cognitive style and their academic performance across curricula showed that the subjects were predominantly field dependent socially oriented learners. Results in Griffin and Franklin's (1996) study also showed a significant correlation between low grades and a field dependent cognitive style as analytic students performed significantly better on course test and had higher academic potential than non-analytic students had. Also, in the path analytic study of cognitive style and Chemistry achievement done by Aghadiuno (1992), analytic individuals performed better than non-analytic individuals in Chemistry achievement tests. In addition, the study of Onyejiaku (1980) found a positive relationship between analytic style and performance in mathematics and science subject matter. These entire findings are similar to earlier findings by Baliv (1976) that investigated the learning and thinking styles of college students and found that liberal art and engineering students differed in their perceptu-

al modalities. Similarly, the study of Lyon (1994) showed that when computer-based instruction in office systems was used, analytic students performed better than non-analytic students.

Cognitive Style, Gender and Academic Performance

Several studies showed differences in the way male and female students learn. In general, the conclusions of most studies on cognitive styles and gender is that females are more of relational learners, while males are more of independent learners. For instance, using the Kolb cognitive Style Inventory, Matthews and Hamby (1995) found differences in preferences by race and sex, though race correlated more between the two. Moreover, over the last decade, research has shown that male and female learners have different class experiences because they approach learning differently, although the reasons for such differences continue to be debated (Callahan 1984). This means that in the classroom, female students prefer to use conversational style that foster group consensus and build ideas on top of each other whereas Fritz (1992) found that male learners were more field independent. Similarly, the study of Frazer (1980) on Egyptian secondary school students found a lack of gender differences in impulsivity/reflectivity and no differences among impulsivity/reflectivity between impulsivity/reflectivity and creative thinking, critical thinking, and intelligence. The study of Buckley (1992) also reported no significant difference in the academic attainments of female and male field independent senior secondary II students in Chemistry achievement. Onyejiaku (1980) found that non-analytic boys scored significantly higher than the non-analytic girls, and analytic boys scored significantly more than analytic girls. Oyekan (1984) also found that female and male field independent groups are academically superior to their field dependent counterparts. This agrees with the findings of Baliv (1976), Onyejiaku (1980), Busari (1987) and Fritz (1992) as they found that females rely more on acculturated values to interpret situations, desire peer input to organise experience and shape decisions than males. According to them, male students love situations that involved numbers and logic, computing and solving mathematical problems and course work that was logically and clearly organised than females. In Canfield's Learning Style Inventory

(1988), while more males preferred applied learning styles, females preferred abstract (involving copious reading and assignments, organized learning materials and instructors that demonstrate knowledge). These results indicate the importance of using different instructional styles to cater for the learning needs of students. Also, in her study of women's classroom experiences, Persaud (1999) found that female students participated more in feeling-oriented classrooms which they also perceived as warm, involving and facilitative of their education.

In the results of the study of Naqvi and Naqvi (2017) while male students' performance scores were higher in financial marketing disciplines, female scores were higher in human resource and international business disciplines. Similarly, in the studies of Abdul and Ansari (2017) on the relationship between learning styles, learning achievement in mathematics and gender, results showed no relationship between learning styles, gender and interaction of learning styles to learning achievement. Also, in the studies of Gebru et al. (2015), there was a relationship between cognitive styles and gender although the accomdator mean score of female students was higher than that of male students. In contrast, D'Amore et al. (2012) showed that female students had a higher reflective observation score than male students. However, results from the study of Gappi (2013) showed non-significant effect of gender, age and academic program on the cognitive style preferences of students. In addition, a study by Naqvi and Naqvi (2017) on learning styles, gender and academic performance of post graduate management students in India, showed that learning styles and gender were independent for management students both on the perceiving and processing dimensions. From the foregoing, it is obvious that studies on cognitive style and students' academic performance are inconsistent and often contradictory and this makes the present study worthwhile.

METHODOLOGY

Research Design

The study drew on a descriptive survey research design. This type of design has the ability to provide measurable evidence, establish (probable) cause and effect, provide efficient data-collection procedures, create opportunity

to replicate and generalise to a population, facilitate the comparison of groups, and provide insight into breadth of experiences (Creswell and Plano-Clark 2011).

Research Instrument

The variables identified in the study for the research questions and data collection instruments were:

- i. Cognitive style and academic performance.
- ii. Cognitive style and academic performance based on subject specialization of students. Academic performance is the field. The time dimension is cross sectional and the communication mode of collection is survey.

The data was gathered through the use of the following research instruments.

- i. Cognitive style questionnaire
- ii. Second term examination result of students in English and mathematics.

In addition, relevant and vital data, namely enrolment statistics, distribution of students by subject specialization and others were collected from the school authority. Two different instruments were used for data collection namely; the accommodator cognitive style questionnaire and converger cognitive style questionnaire (ACSQ and CCSQ) respectively. This is to determine the relationship between these types of cognitive styles and academic performance of students. The questionnaire consists of two sections (A and B). Section A consists of items on students' demographic information such as gender, school and subject specialization. Section B contained items designed to identify students' cognitive style. Twenty six resource questions were used to score the respondents and the scoring schedule was structured among the 4-point likert scale systems.

Population

The population of the study consisted of senior secondary school students 2 (SS2) (in Ogun State, Nigeria) who are in the age range of 14 to 18 years.

Sample and Sampling Technique

The sample consists of 200 SS2 students purposively selected from five co-educational secondary schools in the Ijebu Ode local government area of Ogun State. Forty (twenty arts and twenty sci-

ence) students were purposively selected from each school. Students in these age bracket were chosen because they have the ability to think about the on-going cognitive processes in their minds and were also able to report these introspections which were necessary to answer the learning style inventory. The five co-educational secondary schools were purposely selected from Ijebu-East local Government area of Ogun State and the criteria for selection included the following:

- i. The school must be co-educational
- ii. The students must be offering art and science subjects
- iii. The school must have students in Senior Secondary School 2 (SSS 2).

Data Collection Procedure

The accommodator cognitive style questionnaire and converger cognitive style questionnaire (ACSQ and CCSQ) were administered to all the learners selected for the study. It took the participants about 30 minutes to complete the questionnaire and their classrooms were used for this activity. The Vice principals (Academic) in each school assisted the researcher in making the learners cooperate to fill the questionnaires. To ensure that the participants understood the procedures, the questionnaire instructions were read out aloud repeatedly.

Data Analysis

Each respondent's average score in English and mathematics were compiled to obtain their academic performance scores. To score the questionnaire, the items in the scale were sorted for positive and negative keying. The score per item was between 1 and 4 giving obtainable minimum and maximum scores over the 13 item questionnaire for accommodator cognitive style and 13 for converger cognitive style. Thus, for positively keyed items, SA = 4, A = 3, D = 2 and SD = 1. The total score of each respondent on the whole questionnaire was used as a measure of students' cognitive style. Data were analysed using multiple regression statistics with its derivatives.

Ethical Standards

Approval for conducting the research was obtained first from the Department of Guidance and counseling, University of Ibadan, Nigeria.

All the participants were informed about the study and its goals. The protection of their privacy and sensitivity was also ensured. They were also told that their participation in the research was voluntary and they have a right to terminate their participation at any time. Great care was taken to ensure that social, political and human implications of the study did not cause any harm.

RESULTS

The following are major findings of data analysis:

Research Question 1: To what extent will accommodator, converger, area of specialization and gender factors predict academic performance among secondary school students?

From the data in Table 1, 134 students fall into the converger cognitive style while 66 students fall into the accommodator cognitive style. Results obtained from the multiple regression analysis provided answers to the research question and these are presented in Table 2.

Table 2 shows information about the quantity of variance that is explained by the predictor variables (gender, area of specialization, converger and accommodator). The first static R is the multiple correlation coefficient between all the predictor variables and the dependent variable (academic performance). The value is 0.28 and this indicates that there is small variance shared by the independent variables and the dependent variables. The next value, adjusted R² which is 0.063 indicates that only 6.3 percent of the variance in the dependent variable is explained by the independent variables. Anova in

Table 1: Categorization of students according to their cognitive style

<i>Cognitive style</i>	<i>Frequency</i>	<i>Percentage</i>
Accommodator	66	33
Converger	134	67
	200	100

the table describes the overall variance accounted for in the study. The Anova yielded an F ratio of 4.348 which indicates that the four variables are significant and as such accommodator, converger, area of specialization and gender factor predict academic performance among secondary school students well.

Research Question 2: To what extent will each of the independent variables (accommodators, convergers, gender and area of specialization) predict academic performance among secondary school students?

In Table 3, the coefficient values of the predicting variable were shown as -.94, -2.80, -0.15 and 0.11 respectively. This shows a significant contribution of gender, area of specialization, converger and accommodator with academic performance. It further reveals that the total effect of the predicting variables significantly affect the academic performance of SS2 students.

Table 4 (Coefficients) shows information about the effects of individual predictors. In this table, the Beta coefficients (Standardized Coefficients) for gender, converger and area of specialization were expressed in the same scale. This shows that other factors lying outside this study could predict academic performance. Examining the t statistics for the four independent variables, it could be

Table 2: Multiple regression table showing relationship between academic performance and the predicting variables

Table 3 Model Summary R=.286a R ² = 0.82 Adj. R ² = .063 S.E=13.51					
Anova					
<i>Source</i>	<i>Sum of squares</i>	<i>Df</i>	<i>Mean square</i>	<i>F</i>	<i>Sig.</i>
Regression	374.219	4	793.555	4.348	.002a
Residual	35592.569	195	182.526		
Total	38766.789	199			

a. Predictor (constant), area of specialization, converger, gender accommodator.
 b. Dependent variable — academic performance.

Table 3: Inter correlation matrix between academic performance and predicting variables (gender, area of specialization, converger and accomodator cognitive style)

<i>Variables</i>	<i>Academic performance</i>	<i>Gender</i>	<i>Accomodator</i>	<i>Converger</i>	<i>Area of specialization</i>
Academic Performance	1.000				
Gender	-0.94	1.000			
Accomodator	-0.15	.038	1.000		
Converger	-0.11	-.032	-.933	1.000	
Area of Specialization	-2.80	-2.80	.195	-.175	1.000

N - 200, Df = 198, significant at 0.05 level.

observed that only 'area of specialization' is associated with high level of significance value of 0.05. This indicates that having 'area of specialization' only as a domineering factor on the determination of academic performance when other three predictors are suppressed cannot be rejected. The table also shows the beta values of converger, accomodator, area of specialization and gender as -.014, -.028, -.279 and -.045 respectively. This simply shows that area of specialization is a higher predictor while converger is a lower predictor of academic performance. This can be buttressed by the significance value in the analysis of each predictor.

DISCUSSION

The Anova score corroborated with the F value of 4.34 thus reflecting a significant effect of independent variables and academic performance. The findings in this study is in agreement with Rita Dunn's (1989) different studies on cognitive styles and academic performance where positive relationship between learning styles and academic performance were found in

thirteen of these studies. This also agrees with the studies of Dunn et al. (1995) who conducted a meta-analysis of 43 experimental studies based on the learning style model developed by Dunn and Dunn and concluded that students who had higher levels were those who were taught according to their cognitive styles. This result of this study also agrees with those of some scholars (Malcom 2009; Lynch et al. 1998; Newland and Woelfi 1992 and Kolb 1984) as they found that accommodators and diverger students were slightly less successful than converger and assimilator students.

This study's findings is also supported by those of Granney and Boatman (1984) who found a significant relationship between learning style preferences and performance in a college pharmaceutical programme's specific courses even though the study focused only on university students who were involved in a highly technical programme and were already successful students at that time. Other related studies that agree with the findings of this study are those of Bailey et al. (2000); Rasool and Rawaf (2008); Orhan (2012); Rahmani (2012); Tabatabaei and Mashayekhi (2012) Williams et

Table 4: Standard regression weight table showing the betas of the predicting variable as correlates of academic performance of secondary school II students

<i>Model</i>	<i>Source</i>	<i>Unstandardized coefficients</i>		<i>Standardized coefficients</i>	<i>Sig.</i>
		<i>B</i>	<i>Std. error</i>	<i>Beta</i>	
1	(Constant)	60.93 1	6.473		9.410
	Gender.	-1.266	1.942	-.045	-.652
	Accomodator	2.022E-02	J39	f.028	-.145
	Converger	-9.839E-02	136	h.014	K072
	Area of Specialization	-7.782	1.979	-279	3.931
					005

a. Dependent Variable: Academic Performance

al. (2013) and Yazici (2017). The study is also in agreement with that of Singh (2017) who explored the relationship between cognitive style and academic achievement of elementary school learners and found a link between cognitive style and learning style which also determined the achievement of learners. The studies of Mahyuddin et al. (2011) which showed no significant difference in the academic achievement of students with converging, diverging, accommodating and assimilating learning styles also agrees with the finding of this study. Similarly, McCarthy's (1980) studies on learning styles and academic performance is not consistent with this study because she found that learning styles like Kolb learning styles inventory were not good predictors of academic success in a professional accounting programme and that there were grade point differences between learning style preferences and the courses offered under the study. However, this difference may be due to the fact that the findings were related to a study of second-year college accounting students and not secondary school students as in the present study.

In the studies carried out by Zywno (2003), many intervening variables influence students' performance scores over the undergraduate studies period through interactions with learning style variables. Some of these intervening variables relate to a variety of teaching styles and of academic performance expectations of undergraduate students. This study also substantiates with the report of Aremu (2004) that one of the factors responsible for students' poor academic performance is the student's learning styles which also agrees with many studies that are related to learning styles and gender. For instance, using Canfield's learning style inventory (1988), while more males preferred applied learning styles while females preferred abstract (where learning materials are well organized and instructors demonstrate knowledge) learning styles.

The finding of this study also support that of Simpson (1995) on 693 American mid-western university and a community college students which reveals significant differences between male and female learners where more females than males demonstrate strong preferences for social/conceptual learning styles. However, gender differences in cognitive style may be

due to the fact that male learners are not as organised and do not prefer copious reading assignments and are perhaps indifferent whether instructors are knowledgeable. However, Fredick's (1991) study on the relationship between cognitive style and academic performance with 66 second-year dental students at Virginia Commonwealth University revealed a contrary result to this study. Nevertheless, using the Kolb learning style, Matthew and Hamby (1995) found that college students tend to score higher as divergers and accommodators than do high school students. However, this finding was related to a study of second-year accounting students and the courses they were enrolled for applied to their majors while this study is applied to science and art students. This may account for the differences between the two studies.

The second research question which sought to know the relative contribution of each of the predicting variable to the dependent variable showed area of specialization as the highest contributor followed by gender then accommodator and finally converger. The results of this study however agrees with that of Matthews (1996) who used Kolb's learning style inventory and found out that students with converger learning styles made up the smallest percentage of all students but graded themselves highest on their perceptions of their own academic performance, compared to all other students. However, the finding of this study did not agree with that of Naqvi and Naqvi (2017) which showed that the distribution of learning style type preference of the chosen sample of students was more concentrated towards assimilating and converging styles. The difference in the two results may be due to the fact that the study of Naqvi and Naqvi (2017) was conducted for post graduate students in India while this present study was conducted among secondary school learners in Nigeria.

CONCLUSION

The findings of this study revealed that the predicting variables (gender, accommodator, converger and area of specialisation) have a significant relationship ($F = 4.348$) with academic performance. The implication of this is that

students, irrespective of their gender and areas of specialisation can be stimulated towards better academic performance through appropriate learning styles. This further implies that teachers, parents, educational psychologists, counselors and the likes can help promote academic performance in learners if they strive to identify students' areas of weaknesses and strengths in relation to their learning styles. Thus, identifying students' preferred cognitive style will stimulate their academic performance and also help to explain to teachers and counselors why some students achieve and why some fail as they do. The implication of teachers possessing knowledge of students' cognitive style will assist them in making the correct decisions about their subjects' content, resources, teaching strategies, curriculum and the likes. Teachers will also be able to accommodate a variety of learners in the classroom and this may enhance students' achievement.

RECOMMENDATIONS

Based on the findings and conclusion of this study, it is recommended that teachers must learn how to gather inventories on students' cognitive style vis-à-vis their academic performance. Students' varying learning needs should also be accommodated when varying instructional styles and teachers teach students with learning styles that will enhance their learning. Moreover, teachers must be able to encourage students to recognize and use their varying personal styles. The study also recommends that counselors should assess students' cognitive style vis-a-vis teachers' cognitive style and teaching methods. They must also develop a counseling activity based on students' needs as well as plan teaching outcome for teachers so as to find out how teachers' methods and teaching styles are comparable with students' cognitive style.

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NOTES

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