

INFLUENCE OF COGNITIVE STYLE AND GENDER ON STUDENTS' INTEREST, ACHIEVEMENT AND RETENTION IN GEOGRAPHY IN SENIOR SECONDARY SCHOOL IN NSUKKA EDUCATION ZONE ENUGU STATE, NIGERIA

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Abstract

This study explored the influence of cognitive style and gender on students' interest, achievement and retention in Geography in Nsukka Education Zone. The study adopted Quasi-experiment design. The population of the study comprised 5247 males and female senior secondary school class-two (SS2) students in the 59 public secondary schools in Nsukka educational zone. The sample for the study comprised 105 senior secondary school class-two (SS2) students made up of 48 males and 57 females from four public secondary schools in the zone drawn using multistage sampling technique. Three sets of instruments were used for the study: Oltrain, Raskin, Herman and Witkin (1971) Group Embedded Figures Test (GEFT) adopted by the researcher, Geography Interest Scale (GIS) and Geography Achievement Test (GAT). Analysis of Covariance (ANCOVA) was used to test the null hypotheses formulated at 0.05 level of significance. The study found that there is significant difference in the mean interest, achievement and retention scores of students with field dependent and field-independent cognitive styles in Geography in senior secondary schools in Nsukka Education Zone. Based on the findings, the study recommended that schools should adopt cognitive style patterns (field-dependent and field-independent) in teaching and learning Geography in senior secondary schools.

Keywords: Achievement, Cognitive Style, Geography, Interest, Retention

Introduction

The role of geography in our daily and rational life as well as the interrelationship of human beings with resources and nature is undaunted. Many of our daily to day activities revolves around geography. The knowledge of geography is said to be very useful to everyone who seeks to cope with the ever-changing trends of our environments. Kerkpatrick (2010) sees Geography as a science that deals with spatial distribution of all phenomena on the earth surface; describes the surface of the earth and its inhabitants. It is said that Geography is one of the most important subjects in the school curriculum. In Nigeria, geography is an important school subject in the curriculum. The objectives of teaching Geography have been thought of in terms of what geography can contribute to the realization of the aims of secondary education in Nigeria. Obasi (2010) expressed clearly that the importance of geography has clearly been shown in the senior secondary school curriculum thus: to understand the concept of spatial relationship of the surface features of the earth; acquire appropriate skills; demonstrate a basic knowledge of the nature and functioning of physical and human environments, particularly an understanding

of their inter-relationships and resulting issues; among others (National Policy on Education 2017).

Suffice it to say, that from these objectives, geography is not only taught for the learners' acquisition of knowledge but also to develop certain values and skills such as respect for others' values, sound judgment, learn observation, accurate measurement and reflective thinking among others. The acquisition of these values and skills will help the learners to cope with the challenges in their daily lives. Furthermore, the teaching of geography also should offer a unique means of furthering inquiry and high intellectual growth in students. These shows the importance of geography in achieving the national educational goals whose significance cannot be over-emphasized hence the need to investigate the factors that may influence students' interest, achievement and retention in Geography in senior secondary schools.

One common challenge facing teachers is how to introduce and teach in a manner that would generate interest in their students. Dewey much earlier in 1913 argued that if interest can be secured in a given of facts or ideas, it will be perfectly sure that pupils will direct their attention or energies towards mastering them. The author further claim that a strong interest will sustain an individual's attention and lead to sustained effort in accomplishing an academic goal. Kpolovie (2014) defined interest as a psychological state of having an effective reaction to and focus attention for particular content and or the relatively enduring predisposition to engage repeatedly in particular classes of objects, events or ideas. Tella, Tella and Adeniyi (2011) found that interest was important in educational success. On the contrary some other researchers have equally found interest was not necessarily important in educational success. For example, in research by Olaf, Jurgen and Kai (2010) involving 602 students in Germany, found out that interest had no significant effect on learning from grade 7 to grade 10 but affected their course selection. Also, Goulart and Bedi (2011) working on the impact of interest on educational success in Portugal, noted that after controlling for time-invariant unobservable traits for the simultaneous determination of interest and achievement there is little support for the idea that prior interest in school has a bearing on future educational success.

This has also been corroborated by high failure in public examinations is the country such as the West African Examinations council (WAEC) and National Examination council (NGCO), studies have shown a decline in students' performance in sciences and geography in particular has been attributed to the fact that strategies used in our classrooms are not very effective (Akinniyi, Oladeya & Adewumi, 2018; Filgona, Sababa & Filgona, 2016). The West African Examinations Council (WAEC) chief examiners reports extracted from 2008-2018 and 2019-2021 show that Nigerian students perform poorly in geography and the identified area of student weaknesses are map work, presentation of diagrams, and poor catenations. This issue may boil down to students' retention capacity hence it is worthy to emphasize on the retention capacity of a student.

Retention in learning is the ability to keep or retain facts, figures and information in the students' memory. The level of retention among students varies according to their abilities and skills. A typical investigation is that students forget most of the specific facts

taught, but remember the important concepts and principles. Therefore, the nature of this subject calls for paradigm shift from teacher-centred to learner-centred instructional strategies that permit active involvement of learners in the learning process such that more meaningful learning can be achieved. The situation of poor achievement in geography have warranted this study to explore students' cognitive learning style which may be of benefit in improving achievement in selected areas in Geography.

It has been observed that students have different ways of perceiving and reasoning geography concepts based on their mental readiness. In other words, students have different cognitive style which may affect their learning. Cognitive style is an individual way of learning, perceiving, thinking and reasoning, cognitive psychologist such as Ausubel, Ebruner, Gagne and Educators (teachers) have been interested in understanding the individual differences in cognition and their impact on learning and instruction (Altun & Cakar 2006).

Cognitive style is a psychological construct which is concerned with how an individual learns, thinks, remember, solves problem and relates to others. Srinivas (2011) referred to cognitive styles of field independence and field dependence as the extent to which individual uses internal or external frame of references in addressing a given problem. Ahmadzade and Shojae (2013) also defined cognitive style, as a variable, determines distinct ways in which people usually respond to the same task under the same condition. This implies that each student has a preferred cognitive style, which is affected by such factors. An individual is either a field dependent (FI) or field independent (FD).

Field dependence/independence style determines the way individuals experience their surroundings, either globally or analytically (Rastegar & Honarmand, 2016). People who are field dependent have a general view of things, failing to focus on minor details. On the contrary, field independent people are keen observers with an eye for details, ignoring the background in which the details emerge. Field dependent individuals rely on external signals and shapes, have short memory spans, are simply distracted and prefer natural learning situations. On the contrary, field independent individuals are naturally more motivated, more investigative and self-reliant, have higher concentration and longer memory spans, rely more on internal signals and prefer academic environments in which they can achieve their goals through competition (Blakely & Tomlin, 2008). Hence, where field-dependent learners see a forest, field independent learners see the trees with the forest.

However, the students' cognitive styles may hinder or facilitate the acquisition of knowledge in science (Okwo & Otuba, 2007). Ahmadzade and Shojae (2013) posited that students with FI cognitive styles tend to thrive in scientific disciplines while students with FD cognitive styles tend to do better in humanitarian disciplines. There is need to determine how students' cognitive style may affect achievement in geography. In addition to cognitive styles, gender is also a significant factor that can influence students' interest, achievement and retention in Geography in senior secondary.

Gender factor in academic attainments has been the concern of educational researchers and administrators over the years. Yang (2010) defined gender as the social attributes and opportunities associated with being male and female and the relationship

between women and men; girls and boys, as well as the relations between women and those between men. These attributes, opportunities and relationships are socially constructed and are learned through socialization processes. Gender differences have become critical issues of concern around the world most especially to educators and researchers. Hansman, Tyson, and Zahidi (2009) reported that there is no country in the world that has reached equality between women and men in different critical areas. Okereke and Onwukwe (2011) in their study that male students performed better than female students in science subject, studies conducted across the world among students studying in different levels found a significant gender difference in academic performance several student have reported that female students out perform their male counter parts (Orabi 2007, Dayioglu & Turut 2007, Khwaileh & Zaza, 2010). Ghazviniz and Khajehpour (2011) further argued that even gender difference exists at the level of cognitive functioning in academic environment. Girls are likely to be more adaptive in learning in a different environment.

However, Wangu (2014) in study conducted among the students of secondary schools in Kenya observed boys passing more than girls. On the contrary, Oludipe (2012) and Kola and Taiwo (2013) observed in their various studies that there is no gender difference between male and female performance. Similarly, Udousoro (2013) in the study on gender differences in computing participation stated that there is no significant difference in the academic performance of male and female students Goni (2015) in a study conducted among college going students did not observe a significant gender difference in academic performance. Considering all these views, one cannot draw a meaningful conclusion on the influence gender on academic achievement of students since studies on gender differences in achievement are still inconclusive. Therefore, the researchers consider it worthwhile to investigate the effect of gender on students' interest, achievement and retention in Geography.

Statement of the problem

In any event, the assumption is that the persistent helplessness pattern in Geography students' interest, achievement and retention scores among Nigerian students can be attributed to many factors including cognitive styles. The methods through which students measure and recover information define their level of accomplishment. As a result, the student's cognitive style as well as gender may influence Geography students' interest, achievement and retention. The problem of this study was to determine whether or not this postulation is correct significantly or not. Put in a question form therefore, does gender and cognitive styles have influence on students' interest, achievement and retention in Geography?

Purpose of the study

The main purpose of this study was to investigate the effect of cognitive styles and gender on students' interest, achievement and retention in Geography in senior secondary schools in Nsukka education zone. Specifically, the study determined if there was a significant difference in the.

1. Mean interest scores of students that exhibit field-dependent and field-independent cognitive styles in geography senior secondary school in Nsukka Education Zone.
2. Mean interest scores of male and female students that exhibit field-dependent and field-independent cognitive styles to Geography in senior secondary schools in Nsukka Education Zone.
3. Mean achievement scores of students that exhibit field-dependent and field-independent cognitive styles in geography senior secondary school in Nsukka Education Zone.
4. Mean achievement scores of male and female students that exhibit field-dependent and field-independent cognitive styles to Geography in senior secondary schools in Nsukka Education Zone.
5. Mean retention scores of students that exhibit field-dependent and field-independent cognitive styles in Geography senior secondary school in Nsukka Education Zone.
6. Mean retention scores of male and female students that exhibit field-dependent and field-independent cognitive styles to Geography in senior secondary schools in Nsukka Education Zone.

Hypotheses

The following hypotheses guided the study and were tested at 0.05 level of significance.

H₀₁: There is no significant difference in the mean interest scores of students that exhibit field-dependent and field-independent cognitive styles in Geography senior secondary school in Nsukka Education Zone

H₀₂: There is no significant difference in the mean interest scores of male and female students that exhibit field dependent and field-independent cognitive styles to Geography in senior secondary schools in Nsukka Education Zone

H₀₃: There is no significant difference in the mean achievement score of students that exhibit field-dependent and field independent cognitive styles to Geography in Nsukka Education Zone

H₀₄: There is no significant difference in the mean achievement score of male and female students that exhibit field dependent and field independent cognitive styles to geography in Nsukka Education Zone

H₀₅: There is no significant difference in the mean retention score of students that exhibit field dependent and field independent cognitive styles to Geography in Nsukka Education Zone

H₀₆: There is no significant difference in the mean retention score of male and female students that exhibit field dependent and field independent cognitive styles to geography in Nsukka Education Zone

Theoretical Framework

Theoretically, the study is anchored on Piaget theory of cognitive development. The theory holds that children are born with a very basic genetically inherited mental structure (schema) that evolves and is the foundation for all subsequent learning and knowledge. He saw cognitive development as a progressive reorganization of mental processes resulting from maturation and experience. Also, the study will be hinged on the meta-theory of problem solving. Its tenet is to teach people to think, to use their rational powers to become better problem solvers. The findings of this study validated the tenets of these theories.

Methods

The study adopted Quasi-experiment design: Pre-test-posttest nonequivalent group design. The study was carried out in Nsukka Education Zone of Enugu State. The zone consists of three (3) Local Government Area, which Igbo-Etiti, Nsukka and Uzo-Uwani there are fifty-nine (59) public secondary schools located in the area.

Population and Sample

The population of the study comprised of 5247 males and female senior secondary school class-two (SS2) students in the fifty nine (59) public secondary schools in Nsukka educational zone. The distribution of the students are as follows, Igbo Etiti 641 boys and 797 girls, Nsukka 1462 boys and 1665 girls while Uzo-Uwani with 307 boys and 385 girls (PPSMB Nsukka 2019/2020). The sample for the study comprises of 105 senior secondary schools class-two (SS2) students made up of 48 males and 57 females from four public secondary schools in the zone draw using multistage sampling technique. First, proportionate stratified sampling technique was used to select the number of students that was used for the study. Thus the distribution of the students from the three Local Government Area are as follows: Igbo-Etiti, 13 Boys and 16 girls making a total of 29 students; Nsukka 29 boys and 33 girls making a total of 62 while Uzo-Uwani 6 boys and 8 girls making a total of 14 students. Secondly, a sample random sampling technique was used to select four schools that was used for the study. The distribution of the schools are as follows: Igbo-Etiti, one (1) school from Nsukka two (2) schools while from Uzo-Uwani one (1) school mainly a total of four (4) schools. In each school one intact class was randomly selected and used for the study. Each intact is made of male and female students. The four intact classes were further assigned randomly to experimental and control groups.

Instrument for data collection

Three sets of instruments were used for the study. The three instruments are Oltrain, Raskin, Herman and Witkin (1971) Group Embedded Figures Test (GEFT) adopted by the researcher, Geography Interest Scale (GIS) and Geography Achievement Test (GAT). First the Group Embedded Figures Test (GEFT) was used to classify participants into field dependent and field independent cognitive styles. The test is a perceptual test that requires a person to locate 8 simple figures when they are embedded

with the a large complex figures. The test contains three sections. The first section having seven items is used for practice, while the last two sections with nine items each, were scored. Each figure correctly located within the group embedded figures was scored. Scores on the GEFT reflects abilities in perceptual disembedding. The higher the score the higher the cognitive styles is field dependent. A medium point of (9) was used as cut-off point. Thus, students who score (9) and above were classified as field dependent. The second instrument was the Geography interest scale, that contains two sessions A and B. Section A contains the personal data of the respondents while section B contains 30 items structured in likert scale type of strongly agree (SA=4) agree (A=3). Disagree (2) strongly disagree (SD=1). The GAT contains 30 items and each question has options (A-D) to be selected from.

Validation and Reliability of the instrument

The group embedded figures test GEFT was adopted by the researcher and was not subjected to any further validation. GIS was validated by three experts, one from measurement and evaluation unit of Science Education Department and two experts from Geography Education of Social Science Education, University of Nigeria Nsukka. Also, the GAT were subjected to face and content validation by giving them to three experts in measurement and evaluation, Science Education Department and Geography Education in the Department of Social science education University of Nigeria, Nsukka. Based on their contributions, the instrument was fine-timed before final administration on the respondents. The instruments were trial tested on 40 students from Obollo-Afor education zone outside the study zone but they share similar characteristics with the study zone. The reliability of instrument was done using Cronbach's Alphas coefficient for GIS and K-R20 for GAT. Thus the reliability index for GIS is 0.82 while the reliability index for GAT is 0.79 respectively. This shows that the instrument is reliable for use. The researcher could not subject the GEFT to trial testing because the researcher adopted the instrument. According to Witkin, Oltman Raskin, and karp (1971), the GEFT has satisfactory reliability of 89 on test-retest over a three year period.

Experimental procedures and Method of data analysis

The experiment lasted for a period of six weeks. At the end of the experiment post-test was administered which was a disguised pre-test to the research subjects, the pretest was disguised to avoid the test effect on the subjects. The whole exercise of teaching and testing was monitored by the researcher to ensure that there was no deviation from the specification in the guide. Analysis of Covariance (ANCOVA) was used to test the null hypotheses formulated at 0.05 level of significance.

Results

Ho₁: There is no statistical significance difference in the mean interest scores of students with field dependent and field independent cognitive styles in Geography in senior secondary schools in Nsukka Education Zone.

Table 1: Pretest-Posttest Mean interest scores of students with field dependent and field independent in Geography among senior secondary school students in Nsukka Education Zone

Groups	N	Pre-test		Post-test		Mean Gain Scores	Mean Gain Difference
		Mean	SD	Mean	SD		
Field dependent	67	19.52	3.85	25.83	5.57	6.31	.47
Filed independent	39	20.21	3.38	26.05	6.70	5.84	

Result in Table 1 shows the mean interest scores of secondary school students exposed to field dependent cognitive style and those exposed to field independent cognitive style. The field dependent cognitive style had mean achievement score of 19.52 with standard deviation of 3.85 at pre-test and 25.83 with standard deviation of 5.57 at post-test. The mean gain score of students exposed to field “dependent was 6.31. On the other hand, students who were exposed to field independent cognitive style had mean achievement score of 20.21 with standard deviation of 3.38 at pre-test and 26.05 with standard deviation of 6.70 at post-test. The mean gain scores of the students exposed to field independent was 5.84. The mean gain difference of .47 was recorded for the two groups in favour of the students exposed to field dependent cognitive style. The standard deviation of each group from the mean ranged from 3.38 – 6.70; indicating that the respondents were not too far from the mean and from one another in their responses, adding further validity to the mean.

Table 2: Summary of the 2-Way Analysis of Covariance (ANCOVA) of Mean interest scores of students with field dependent and field independent cognitive styles in Geography in senior secondary schools in Nsukka Education Zone.

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	426.515 ^a	4	106.629	3.996	.008
Intercept	957.981	1	957.981	35.901	.000
Pretest FdFi	75.065	1	75.065	2.813	.101
Treatment	295.083	1	295.083	12.041	.002
Gender	14.577	1	14.577	.546	.464
Treatment *	3.751	1	3.751	.141	.710
Error	1147.402	235	26.684		
Total	33504.000	240			
Corrected Total	1573.917	239			

Result of the analysis in Table 2 revealed that field dependent and field independent cognitive styles as a factor in the study has a significant effect on the mean

interest scores of secondary school students in Geography. This is because the calculated F-value of 12.041 in respect of the treatment as main effect has a probability value of .000 and therefore significant at .05 level of significance. This implies that exposing secondary school students to field dependent and field independent cognitive styles significantly increased their Geography interest. Therefore, the null hypothesis of no significance difference in the mean interest scores of students with field dependent and field independent cognitive styles in Geography in senior secondary schools in Nsukka Education Zone is rejected. Therefore, the researcher concludes that there is a significant difference in the mean interest scores of students with field-dependent and field-independent cognitive styles in Geography in senior secondary schools in Nsukka Education Zone.

Ho₂: There is no statistical significance difference in the mean interest scores of male and female students with field dependent and field independent cognitive styles in Geography in senior secondary schools in Nsukka Education Zone.

Table 3: Pretest-Posttest Mean interest scores of male and female students with field dependent and field independent cognitive styles in Geography

Gender	Pre-test			Post-test		Mean Gain Scores	Mean Gain Difference
	N	Mean	SD	Mean	SD		
Male	48	28.11	7.52	68.07	15.64	40.96	2.20
Female	57	28.10	6.94	60.86	13.61	38.76	

Result in Table 3 shows the mean interest scores of male and female students with field dependent and field independent cognitive styles in Geography. The male students had mean interest score of 28.11 with standard deviation of 7.52 at pre-test and 68.07 with standard deviation of 15.64 at post-test. The mean gain score of male students was 40.96. On the other hand, female students had mean interest score of 28.10 with standard deviation of 6.64 at pre-test and 60.86 with standard deviation of 13.61 at post-test. The mean gain scores of the female students was 38.76. The mean gain difference of 2.20 was recorded for the two groups in favour of the male students. The standard deviation of each group from the mean ranged from 6.94 – 15.64; indicating that the respondents were not too far from the mean and from one another in their responses, adding further validity to the mean.

Table 4: Summary of the 2-Way Analysis of Covariance (ANCOVA) of Mean interest scores of male and female students with field-dependent and field-independent cognitive styles in Geography in senior secondary schools in Nsukka Education Zone

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	426.515 ^a	4	106.629	3.996	.008
Intercept	957.981	1	957.981	35.901	.000
Pretest Int	75.065	1	75.065	2.813	.101
Treatment	295.083	1	295.083	11.059	.002
Gender	14.577	1	14.577	.546	.464
Treatment * Gender	3.751	1	3.751	.141	.710
Error	1147.402	135	26.684		
Total	33504.000	140			
Corrected Total	1573.917	139			

Result of the analysis in Table 4 revealed that gender as a factor in the study has a significant effect on the mean interest scores of secondary school students in Geography. This is because the calculated F-value of 11.059 in respect to the treatment as the main effect has a probability value of .002 and is therefore significant at .05 level of significance. This implies that gender influence students' interest in Geography. Therefore, the null hypothesis of no significant difference in the mean interest scores of male and female students with field-dependent and field-independent cognitive styles in Geography in senior secondary schools in Nsukka Education Zone is rejected. Therefore, the researcher concludes that there is a significant difference in the mean interest scores of male and female students with field-dependent and field-independent cognitive styles in Geography in senior secondary schools in Nsukka Education Zone.

Ho₃: There is no significant difference in the mean achievement scores of students with field-dependent and field-independent cognitive styles in Geography in senior secondary schools in Nsukka Education Zone.

Table 5: Pretest-Posttest Mean achievement scores of students with field dependent and field independent in Geography among senior secondary school students in Nsukka Education Zone

Groups	Pre-test			Post-test		Mean Gain Scores	Mean Gain Difference
	N	Mean	SD	Mean	SD		
Field dependent	67	19.93	3.73	28.56	3.38	8.63	5.72
Filed independent	39	19.62	3.63	22.53	6.90	2.91	

Result in Table 5 shows the mean achievement scores of secondary school students exposed to field dependent cognitive style and those exposed to field

independent cognitive style. The field dependent cognitive style had mean achievement score of 19.93 with standard deviation of 3.73 at pre-test and 28.56 with standard deviation of 3.38 at post-test. The mean gain score of students exposed to field dependent was 8.63. On the other hand, students who were exposed to field independent cognitive style had mean achievement score of 19.62 with standard deviation of 3.63 at pre-test and 22.53 with standard deviation of 6.90 at post-test. The mean gain scores of the students exposed to field independent was 2.91. The mean gain difference of 5.72 was recorded for the two groups in favour of the students exposed to field dependent cognitive style. The standard deviation of each group from the mean ranged from 3.38 – 6.90; indicating that the respondents were not too far from the mean and from one another in their responses, adding further validity to the mean.

Table 6: Summary of the 2-Way Analysis of Covariance (ANCOVA) of Mean achievement scores of students with field-dependent and field-independent cognitive styles in Geography in senior secondary schools in Nsukka Education Zone

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	561.076 ^a	4	140.269	5.392	.001
Intercept	425.589	1	425.589	16.360	.000
Pretest FdFi	120.554	1	120.554	4.634	.037
Treatment	424.077	1	424.077	16.302	.000
Gender	1.719	1	1.719	.066	.798
Treatment *	13.734	1	13.734	.528	.471
Error	1118.591	43	26.014		
Total	33920.000	48			
Corrected Total	1679.667	47			

Result of the analysis in Table 6 revealed that field dependent and field independent cognitive styles as a factor in the study has a significant effect on the mean achievement scores of secondary school students in Geography. This is because the calculated F-value of 16.302 in respect of the treatment as main effect has a probability value of .000 and therefore significant at .05 level of significance. This implies that exposing secondary school students to field dependent and field independent cognitive styles significantly increased their Geography achievement. Therefore the null hypothesis of no significance difference in the mean achievement scores of students with field dependent and field independent cognitive styles in Geography in senior secondary schools in Nsukka Education Zone is rejected. Therefore, the researcher concludes that there is a significance difference in the mean achievement scores of students with field dependent and field independent cognitive styles in Geography in senior secondary schools in Nsukka Education Zone.

H0₄: There is no statistical significance difference in the mean achievement scores of male and female students with field dependent and field independent cognitive styles in Geography in senior secondary schools in Nsukka Education Zone.

Table 7: Pretest-Posttest Mean achievement scores of male and female students with field dependent and field independent cognitive styles in Geography

Gender	N	Pre-test		Post-test		Mean Gain Scores	Mean Gain Difference
		Mean	SD	Mean	SD		
Male	48	18.52	4.87	26.34	5.90	7.82	.34
Female	57	17.47	3.03	24.95	5.66	7.48	

Result in Table 7 shows the mean achievement scores of male and female students with field dependent and field independent cognitive styles in Geography. The male students had mean achievement score of 18.52 with standard deviation of 4.87 at pre-test and 26.34 with standard deviation of 5.90 at post-test. The mean gain score of male students was 7.82. On the other hand, female students had mean achievement score of 17.47 with standard deviation of 3.03 at pre-test and 24.95 with standard deviation of 5.66 at post-test. The mean gain scores of the female students was 7.48. The mean gain difference of .34 was recorded for the two groups in favour of the male students. The standard deviation of each group from the mean ranged from 3.03 – 5.90; indicating that the respondents were not too far from the mean and from one another in their responses, adding further validity to the mean.

Table 8: Summary of the 2-Way Analysis of Covariance (ANCOVA) of Mean achievement scores of male and female students with field dependent and field independent cognitive styles in Geography in senior secondary schools in Nsukka Education Zone

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	426.515 ^a	4	106.629	3.996	.008
Intercept	957.981	1	957.981	35.901	.000
Pretest Achiev	75.065	1	75.065	2.813	.101
Treatment	295.083	1	295.083	13.022	.002
Gender	14.577	1	14.577	.546	.464
Treatment * Gender	3.751	1	3.751	.141	.710
Error	1147.402	135	26.684		
Total	33504.000	140			
Corrected Total	1573.917	139			

Result of the analysis in Table 8 revealed that gender as a factor in the study has a significant effect on the mean achievement scores of secondary school students in

Geography. This is because the calculated F-value of 13.022 in respect of the treatment as main effect has a probability value of .002 and therefore significant at .05 level of significance. This implies that gender influence students' achievement in Geography. Therefore the null hypothesis of no significance difference in the mean achievement scores of male and female students with field dependent and field independent cognitive styles in Geography in senior secondary schools in Nsukka Education Zone is rejected. Therefore, the researcher concludes that there is a significance difference in the mean achievement scores of male and female students with field dependent and field independent cognitive styles in Geography in senior secondary schools in Nsukka Education Zone.

H0₅: There is no statistical significance difference in the mean retention scores of students with field dependent and field independent cognitive styles in Geography in senior secondary schools in Nsukka Education Zone.

Table 9: Pretest-Posttest Mean retention scores of students with field dependent and filed independent in Geography among senior secondary school students in Nsukka Education Zone

Groups	Pre-test			Post-test		Mean Gain Scores	Mean Gain Difference
	N	Mean	SD	Mean	SD		
Field dependent	67	18.11	4.52	28.07	5.64	9.96	5.20
Filed independent	39	18.10	3.94	22.86	4.61	4.76	

Result in Table 9 shows the mean retention scores of secondary school students exposed to field dependent cognitive style and those exposed to field independent cognitive style. The field dependent cognitive style had mean retention score of 18.11 with standard deviation of 4.52 at pre-test and 28.07 with standard deviation of 5.64 at post-test. The mean gain score of students exposed to field dependent was 9.96. On the other hand, students who were exposed to field independent cognitive style had mean retention score of 18.10 with standard deviation of 3.94 at pre-test and 22.86 with standard deviation of 4.61 at post-test. The mean gain scores of the students exposed to field independent was 4.76. The mean gain difference of 5.20 was recorded for the two groups in favour of the students exposed to field dependent cognitive style. The standard deviation of each group from the mean ranged from 3.94 – 5.64; indicating that the respondents were not too far from the mean and from one another in their responses, adding further validity to the mean.

Table 10: Summary of the 2-Way Analysis of Covariance (ANCOVA) of Mean retention scores of students with field dependent and field independent cognitive styles in Geography in senior secondary schools in Nsukka Education Zone

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	426.515 ^a	4	106.629	3.996	.008
Intercept	957.981	1	957.981	35.901	.000
Pretest FdFi	75.065	1	75.065	2.813	.101
Treatment	295.083	1	295.083	14.011	.002
Gender	14.577	1	14.577	.546	.464
Treatment *	3.751	1	3.751	.141	.710
Error	1147.402	43	26.684		
Total	33504.000	48			
Corrected Total	1573.917	47			

Result of the analysis in Table 10 revealed that field dependent and field independent cognitive styles as a factor in the study has a significant effect on the mean retention scores of secondary school students in Geography. This is because the calculated F-value of 14.011 in respect of the treatment as main effect has a probability value of .002 and therefore significant at .05 level of significance. This implies that exposing secondary school students to field dependent and field independent cognitive styles significantly increased their Geography retention. Therefore the null hypothesis of no significance difference in the mean retention scores of students with field dependent and field independent cognitive styles in Geography in senior secondary schools in Nsukka Education Zone is rejected. Therefore, the researcher concludes that there is a significance difference in the mean retention scores of students with field dependent and field independent cognitive styles in Geography in senior secondary schools in Nsukka Education Zone.

H0₆: There is no statistical significance difference in the mean retention scores of male and female students with field dependent and field independent cognitive styles in Geography in senior secondary schools in Nsukka Education Zone.

Table 11: Pretest-Posttest Mean achievement scores of male and female students with field dependent and field independent cognitive styles in Geography

Gender	Pre-test			Post-test		Mean Gain Scores	Mean Gain Difference
	N	Mean	SD	Mean	SD		
Male	48	35.93	8.73	64.56	12.38	28.63	3.72
Female	57	36.62	9.63	61.53	11.90	24.91	

Result in Table 11 shows the mean retention scores of male and female students with field dependent and field independent cognitive styles in Geography. The male students had mean retention score of 35.93 with standard deviation of 8.73 at pre-test and 64.56 with standard deviation of 12.38 at post-test. The mean gain score of male students was 28.63. On the other hand, female students had mean retention score of 36.62 with standard deviation of 9.63 at pre-test and 61.53 with standard deviation of 11.90 at post-test. The mean gain scores of the female students was 24.91. The mean gain difference of 3.72 was recorded for the two groups in favour of the male students. The standard deviation of each group from the mean ranged from 8.73 – 12.38; indicating that the respondents were not too far from the mean and from one another in their responses, adding further validity to the mean.

Table 12: Summary of the 2-Way Analysis of Covariance (ANCOVA) of Mean achievement scores of male and female students with field dependent and field independent cognitive styles in Geography

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	561.076	4	140.269	5.392	.001
Intercept	425.589	1	425.589	16.360	.000
Pretest retn	120.554	1	120.554	4.634	.037
Treatment	424.077	1	424.077	16.302	.000
Gender	1.719	1	1.719	.066	.798
Treatment * Gender	13.734	1	13.734	.528	.471
Error	1118.591	135	26.014		
Total	33920.000	140			
Corrected Total	1679.667	139			

Result of the analysis in Table 12 revealed that gender as a factor in the study has a significant effect on the mean retention scores of secondary school students in Geography. This is because the calculated F-value of 16.302 in respect of the treatment as main effect has a probability value of .000 and therefore significant at .05 level of significance. This implies that gender influence students' retention in Geography. Therefore the null hypothesis of no significance difference in the mean retention scores of male and female students with field dependent and field independent cognitive styles in Geography in senior secondary schools in Nsukka Education Zone is rejected. Therefore, the researcher concludes that there is a significance difference in the mean retention scores of male and female students with field dependent and field independent cognitive styles in Geography in senior secondary schools in Nsukka Education Zone.

Discussion of the Findings

The findings of the study were discussed in line with the hypotheses that guided the study. The findings of the study with respect to hypothesis one showed that there is

statistical significance difference in the mean interest scores of students with field dependent and field independent cognitive styles in Geography in senior secondary schools in Nsukka Education Zone. This finding corroborates the earlier findings of Njagi (2015) and Godpower (2017) who found out in their respective studies that innovative teaching technique such as cognitive styles enhance students' interest. Similarly, Asante (2010) established that the application of field dependent and field independent in teaching and learning increases students' interest. In line with the above findings, the present study was carried out to ascertain the efficacy of field dependent and field independent cognitive styles in students' interest in Geography and the findings of the study have been able to prove that field dependent and field independent cognitive styles enhances students' interest in senior secondary schools in Nsukka Education zone, Enugu State.

The findings of the study with respect to hypothesis two showed that there is statistical significance difference in the mean interest scores of male and female students with field dependent and field independent cognitive styles in Geography in senior secondary schools in Nsukka Education Zone. This finding is in line with the earlier findings of Njagi (2015) and Godpower (2017) who found out in their respective studies that gender has influence on students' interest when taught using innovative teaching technique in some specific classrooms as Geography. Similarly, Asant (2010) established that gender plays significant role in shaping students' interest in science related subjects such as Geography especially when a new teaching technique such as field dependent and field independent is applied in classroom teaching and learning experiences. In line with the above findings, the present study was carried out to ascertain if gender has any influence on students' interest in Geography and the findings of the study have been able to prove that gender has significant influence on students' interest in senior secondary schools in Nsukka Education zone, Enugu State.

The findings of the study with respect to hypothesis three showed that there is statistical significance difference in the mean achievement scores of students with field dependent and field independent cognitive styles in Geography in senior secondary schools in Nsukka Education Zone. This finding is in line with the earlier findings of Abakpa (2011) and Collins (2014) who found out in their respective studies that innovative teaching technique such as cognitive styles enhance students' achievement. Similarly, Ogunleye (2015) established that the application of field dependent and field independent in teaching and learning increases students' achievement. In line with the above findings, the present study was carried out to ascertain the efficacy of field dependent and field independent cognitive styles in students' achievement in Geography and the findings of the study have been able to prove that field dependent and field independent cognitive styles enhances students' achievement in senior secondary schools in Nsukka Education zone, Enugu State.

The findings of the study with respect to hypothesis four showed that there is statistical significance difference in the mean achievement scores of male and female

students with field dependent and field independent cognitive styles in Geography in senior secondary schools in Nsukka Education Zone. This finding is in line with the earlier findings of Abakpa (2011) and Collins (2014) who found out in their respective studies that gender has influence on students' achievement when taught using innovative teaching technique in some specific classrooms such as Geography. Similarly, Ajai and Imoke (2015) established that gender plays significant role in shaping students' achievement in science related subjects such as Geography especially when a new teaching technique such as field dependent and field independent is applied in classroom teaching and learning experiences. In line with the above findings, the present study was carried out to ascertain if gender has any influence on students' achievement in Geography and the findings of the study have been able to prove that gender has significant influence on students' achievement in senior secondary schools in Nsukka Education zone, Enugu State.

The findings of the study with respect to hypothesis five showed that there is statistical significance difference in the mean retention scores of students with field dependent and field independent cognitive styles in Geography in senior secondary schools in Nsukka Education Zone. This finding relates to the earlier findings of Fakeye (2010) and Bassey, Umosen, and Udida (2013) who found out in their respective studies that innovative teaching technique such as cognitive styles enhance students' retention in Geography. Similarly, Bhavna and Mark (2010) established that the application of field dependent and field independent in teaching and learning Geography increases students' retention. In line with the above findings, the present study was carried out to ascertain the efficacy of field dependent and field independent cognitive styles in students' retention in Geography and the findings of the study have been able to prove that field dependent and field independent cognitive styles enhances students' retention in senior secondary schools in Nsukka Education zone, Enugu State.

The findings of the study with respect to hypothesis six showed that there is statistical significance difference in the mean retention scores of male and female students with field dependent and field independent cognitive styles in Geography in senior secondary schools in Nsukka Education Zone. This finding is in line with the earlier findings of Fakeye (2010) and Bassey, Umosen, and Udida (2013) who found out in their respective studies that gender has influence on students' retention when taught using innovative teaching technique in some specific classrooms such as Geography. Similarly, Bhavna and Mark (2010) established that gender plays significant role in shaping students' retention in science related subjects such as Geography especially when a new teaching technique such as field dependent and field independent is applied in classroom teaching and learning experiences. In line with the above findings, the present study was carried out to ascertain if gender has any influence on students' retention in Geography and the findings of the study have been able to prove that gender has significant influence on students' retention in senior secondary schools in Nsukka Education zone, Enugu State.

Conclusion

Based on the findings, the study concluded that there is statistical significance difference in the mean interest, achievement and retention scores of students with field dependent and field independent cognitive styles in Geography in senior secondary schools in Nsukka Education Zone. The study again concludes that there is statistical significance difference in the mean interest, achievement and retention scores of male and female students with field dependent and field independent cognitive styles in Geography in senior secondary schools in Nsukka Education Zone.

Recommendations

Based on the findings of the study, the study recommended that schools should adopt cognitive styles patterns (field dependent and field independent) in teaching and learning Geography in senior secondary schools. Since this study has proved that the application of cognitive style patterns increases students' achievement, interest, and retention in Geography, it will be wise that secondary school Geography teachers adopts cognitive style patterns in Geography classroom.

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