

# Cognitive Styles Field Dependence/Independence and Scientific Achievement of Male and Female Students of Zamfara State College of Education Maru, Nigeria

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## Abstract

This study was conducted to examine the association between cognitive styles (Field dependence/Independence) and scientific achievement in Male and Female student of Biology and Integrated science Department of Zamfara State College of Education Maru, the is correlational. A population of 700 students were used, in which 150 were randomly selected using simple random sampling technique. The instrument used in this study is Latent Patterns which was developed by Witkin et al., the reliability coefficient of .82 was established for both Male and Female students, in order to answer the questions descriptive statistics was used as well as t-test, one way analysis of variance ANOVA and Schulte post was also employed. This study revealed that there is significant relationship between Male and Female students Field dependence and Field independence and their academic achievement, the findings also indicates that cognitive styles (Field dependence/Independence) is a significant predictor of scientific achievement in Male and Female student of Biology and Integrated science students of Zamfara State College of Education Maru.

**Keywords:** Cognitive Style, Field dependence and Field Independence

## 1.1 Introduction

Field Independent learner is considered as one who does not limit his learning to the immediate environment and provided materials, can extend and his experience to the wider environment while,

Field Dependent learner is He/she a learner who is mostly dependent on the materials given to him in his environment (Muhammad 2010). Research has shown that cognitive style is different from intellectual abilities. According to Messick (1982), dimensions of intellectual ability refer to the content and level of cognition. Meanwhile, it refers to the questions of what? and how? What kind of information is being processed by what operation and in what form and how well? While, cognitive style refers to the manner or form of cognition. Witkin (1977) and Messick (1982) made further distinctions between cognitive styles and intellectual abilities, the maintained that intellectual abilities are content or domain specific such as verbal or numerical, whereas cognitive styles cut across both ability and personality domains. . Other important dimensions of cognitive style are those of Witkin (1976) his theory is Field dependence and Field independence (FD&FI) with dimension and characteristics of conceptual and analytic. Cognitive styles have been described in a border between mental abilities and personality types (Ahmadzaide and Shojae 2013), according to Noroozi (2003) this psychological areas are important in the teaching and learning as it can affects the preferences for considering the learning environment, and social interactions,

In Nigeria, the definition of cognitive style has also been preferred among which are: Shuaibu and Ogunsola (1982) defined cognitive style in science as the mode of presentation of scientific information which the individual student would find easy to remember. Omoifo (1986) also defined it as individual preferences or tasks. This suggested that “modes” primarily are regarded as preference while the “body” preference which is the characteristics of an individual is referred to Style.

The present study is the study seeks to find out the connection and relationship between cognitive style (Field dependence/Field Independence) and scientific achievement in male and female students in Biology and Integrated Science Department of Zamfara State College of Education Maru. Two questions were raised, they are: relationship between Field dependence cognitive style and scientific achievement among Biology and Integrated science students in Zamfara State College of Education Maru? relationship between Field Independence cognitive style and scientific achievement among Biology and Integrated science students Zamfara State College of Education Maru?, these questions were answered at the end of the study.

## 2.1 Review of Related Literature

People perceive information in different ways they criticise information differently they learn through different ways (Tomes 2004), cognition refers to mental process in the brain used to gain knowledge and comprehension of the outside world (Gibbs 2009) while, Sternberg (2014) define style as an individual differences in approaches

to tasks that can make a differences in the way person perceives, learns or thinks, this differences in learning exist among male and female students,. In or other words a cognitive style is defined as individual characteristics and consistent approach to organising and processing information (Tennent 1988 and Shoae Ahmad Zade 2013). Distinct as they are, learning style and learning strategies have close relationship to each other (Shi 2011), by these different views of cognitive styles it can be generalise that cognitive styles can therefore be viewed as mental process in which individual exhibit his intellectual abilities.

Shoae and Leila (2013) conducted a research to investigate the relationship between cognitive styles (field dependence/independence) and academic achievement in male and female students of Bahaman Islamic Azad university, 7500 students entering the university in 2010-2011 academic year was the population they used. The findings of their study shows that there is a significance positive relationship between male and female students' field dependence and field independence and their academic achievements; cognitive styles is a significant predictor of academic achievement and the also found that girls outperform boys as regards to academic achievement. Their findings are supported with the view of Pith (2006) who stated that divergent approaches to learning and communication are seen as important issues, and there is no dough that field dependence and field independence and styles approaches since it can predict the predominant style of learning.

Ahmadzaide and Shoeje (2013) investigated the relationship between field dependent and field independent cognitive styles and academic achievement in male and female students of Bahaman Islamic Azad, their findings shows that : there were significance relationship between Field dependence and academic achievement in men; but, a significance association between Field dependent and academic achievement in females were found; and Field Independent in women is significantly related to their academic achievement. In another dimation Ibrahim etal (2008) found that most of the students were Field dependent and they were at the concrete level of cognitive thinking; there was also a weak relationship between students cognitive styles, the level of cognitive thinking and the chemistry achievement and revealed that there is no significant difference between the cognitive styles, the level of cognitive thinking and the chemistry achievement. This contradicted the findings of Dragon (2009) who investigated the field dependence and student achievement in technology based learning and found that, an achievement different in favour of field independent learners with a total means weighted effect size of 0.426 and pooled standard deviation of 0.311. that is why cognitive styles is considered as patterns of adjustment to the world that appear to be equally useful but, rely on different cognitive strategies and can result in different perceptions of the world (Klein 1951 and Witkin etal 1962). The research in education applications is still in its early stages, the evidence that research has already produced suggests that a cognitive style approach may be applied with profit to varieties of educational issues (Witkin 1977), He further mentioned that it is clear from the evidence that individual differences in dimension first picked up in perception shows it self equally in the problem-solving domain.

These differences which exist among students, it has impact on their academic achievement as pointed by Damavandi etal (2011) that individual differences play an important role in academic achievement of student, and there has been many attempts to address the problem of low academic achievement and some factors have been identified in explaining academic achievement, but, Pithers (2006) view was only in identifying the approach of cognitive styles, without linking it to academic achievement, where He says one of the major approach to the classification of cognitive styles has been concerned with cognitive processes of exception, memory and thought. While there has been many attempt or research on low academic achievement among students, Stephen (2002) addressed that, different researchers or scholars emphasised different dimation of individual difference which correlate with higher achievement and which hold out some hope for positive action for educational practice.

Hyde (2005), Govers (2007), Eno and Woehlke (1980), Smolak (1986) and Nuzhat etal (2013) reported significant difference between male and female in different cognitive styles, but, was not supported by Myer and Dyers (2006) who revealed that no significance differences in the learning styles of male and female students who enrolled in agricultural leadership development course at the university of Florida nor in their critical thinking. However Hyde (2005) found that male and female are similar on most, but not all psychological variables including cognitive skills, in the same line, Gibbs (2009) shows that gender gap in maths related skills fluctuate based on the type of skills fluctuate based on the type of skills assessed and period observed, and He maintained that thousands of studies have explored gender difference in cognitive skills.

### 3.1 Purpose of the Study and Research Questions

The study seek to examine the connection and relationship between cognitive style (Field dependence/Field Independence) and scientific achievement in male and female students in Biology and Integrated Science Department of Zamfara State College of Education Maru. Two questions were raised, they are:

- i. Is there a significant relationship between Field dependence cognitive style and scientific achievement among Biology and Integrated science students in Zamfara State College of Education Maru?
- ii. Is there a significant relationship between Field Independence cognitive style and scientific

achievement among Biology and Integrated science students Zamfara State College of Education Maru?

### 3.2 Materials and Method

To measure differences in this study one way Analysis of Variance (ANOVA) and Post hoc test were used, however the research is correlational and the response to the research Questions descriptive and inferential statistics have been employed. T-test statistical method was also used to test for significance differences in term of independent samples and correlation coefficient for the relationship.

### 3.3 Population, Sample and Sampling Method

The population of the study consist of 700 NCE 2 students from department of Biology and Integrated Science, out of which 150 were sampled using simple random sampling technique.

### 3.4 Instrumentation and Data Collection

To measure the Cognitive style (Field Dependence and Field Independence) in this study, Latent Test developed by Witkin etal was used. This test has 25 pictures in each, the students are asked to find and colour a geometric shape. The test consists of 3 parts they are:

- i. This includes 7 pictures in which the shape is easy to trace, is a training part showing students what to do and should be completed in 3 minutes
- ii. This part 2 & 3 consists of 9 pictures, which are more difficult to answer than part 1; this part is expected to be completed in 6 minutes.

The ability of students in other word their speed in completing Latent Patterns is what will shows their Cognitive Styles either Field Dependence/Independence. Each correct response has 1 mark, scores range from 0-5 indicates total Field Dependence while, 15 and above represent total Independence cognitive styles.

### 3.5 Validity and Reliability of the instrument

In order to determine reliability of latent patterns of the instrument test re-test method was used, a reliability coefficient of 0.82 for both male and female was established which correspond to the coefficient calculated by Witkin etal (1979). To determine the Validity, Criterion validity coefficient of 72% for male and 62% for female was produced.

### 4.1 Results Obtained

One hundred male Bio/ISC Students (66.7%) and 50 female students (33.3%) participated in this study. There are 45 (30%) students whose CGPA ranges from 2.5 to 4.0, 70 (46.7%) students with CGPA 2.49 to 1.5 and the remaining 35 (23.3%) has 1.49 and below CGPA.

**Table1: Relationship between Field Dependence (Male) and Scientific achievement**

Variable	Correlation coefficient	Sig.
Field dependence (Male)	0.44*	0.01
Scientific achievement		

The above table shows that the correlation coefficient between Field dependence in Male and their Scientific achievement is 0.44 ( $P > 0.01$ ), this indicates that the relationship between Field dependence and Scientific achievement is statistically significant in Male.

**Table2: Relationship between Field Dependence (Female) and Scientific achievement**

Variable	Correlation coefficient	Sig.
Field dependence (Female)	0.51*	0.01
Scientific achievement		

This table illustrates that the correlation coefficient between Field dependence in Female and Scientific achievement is 0.51 ( $P > 0.01$ ) therefore, the relationship between Field dependence and academic achievement is statistically significant in Female.

**Table3: Relationship between Field Independence (male) and Academic achievement**

Variable	Correlation coefficient	Sig.
Field dependence (Male)	0.65*	0.01
Scientific achievement		

The above table predict that the correlation coefficient between Field Independence in Male is 0.65 ( $P > 0.01$ ), meaning that, the relationship between Field Independence and Scientific achievement is statistically significant in Male.

**Table 4: Relationship between Field Independence (Female) and Scientific achievement**

Variable	Correlation coefficient	Sig.
Field dependence (Female)	0.55*	0.01
Scientific achievement		

This table demonstrates that the correlation coefficient between Field Independence in female and scientific achievement is 0.55 ( $P > 0.01$ ) means that the relationship between Field Independence and Scientific achievement is statistically significant in Female.

**Table 5: Regression coefficient, correlation coefficient, and coefficient of determination**

Variable	Constant	$\beta$	$\tau$	Sig.	R	$R^2$
Cognitive style	1.74	0.22	9.2	0.01	0.22	0.1

The above table indicates that, were  $\beta$  is .22 and the Constant value is 1.74 therefore, the correlation between cognitive styles and science achievement is .22, generally cognitive Styles (Field dependence and Independence) predict scientific achievement.

#### 4.2 Discussion of the Results

It can be conclude that there was a significance relation between Field dependence and scientific achievement in Male and Female students of Biology and Integrated science Zamfara state College of Education Maru, this is appropriate to the findings of Ibrahim (2008) who found that most students were Field dependent and are at the concrete level of cognitive thinking, also it support the work of Mokhtarian (2003), but, contradict the findings of Myer and Dyers (2006) who revealed that no significance difference in the learning styles of Male and Female students who enrolled in Agricultural leadership development course in the University of Florida.

Moreover, there was significance relationship of Field dependence and science achievement in Female students, this findings is similar to the results of Ahmad Zade and Shojae (2013) who found that Field dependence students are lower achievers in Basic science and that of Hanayooni etal who found that Field Independence students are more interested in maths than Field Dependence and Field Independence students are self-motivated in science and maths are also less likely to be affected.

In addition, there is a significant relationship between Field Independence and scientific achievement in male, this findings is in line with the work of Noroozi (2003) who revealed that field dependence are higher achievers, but contrary to Omode (2009) who traced that, Field dependence and Field Independence students with style awareness achieve higher scores than their counter parts who received no style awareness.

There is also significance relationship between Field Independence in Female and their scientific achievement, this is in support of the work of Dragon (2009) who found that an achievement differ in favour of Field Independence learners, but contradicts the findings the findings of Hyde (2005), Govers (2007), and Nuzhat etal (2013), they all reported significance difference and between Male and Female in cognitive style. In the same vein positive relationship of Field dependence and Field Independence students and their academic achievement was revealed by Shoe and Leila (2013).

Conclusively, cognitive Style Field Dependence and Field Independence established significance difference in Learners. Field Dependence students tend to learn science as a whole not in a separate parts, they did not depends to be learning motivation, they are not active Lerner instead they are passive. Field Dependence cognitive style students tend to be analytic, have in net influence for learning social issues, they do not have ability to criticise information, they always be influence by the learning environment, in contrast, Field Independence cognitive styles students are independent they can learners and criticise information presented to them, they have ability to learn the whole information not in a separate parts, they are always active learners. Both Field dependence and Field Independence cognitive styles has strength and weakness that is why it do not mean that one cognitive style is superior than the other, the truth is that students (Male and Female) whose learning style did not match the methods of instructional materials and are negatively affecting their general achievement.

### 4.3 Recommendations

From the above discussions, the following are the suggested recommendations

- It is recommended that cognitive style students should be given important attention in the designing the instructional methods
- Teachers, curriculum designers and developers as well as educational organisations need to consider the relationship and importance of cognitive styles in students' achievement particularly in science instructions.
- Since individual differences in learning styles exist among students there is the need for the teachers at all levels to know how they can manage such differences in their classroom instructions.
- Governments at all levels should provide adequate instructional aids and materials to all institutions of learning to enhance effective teaching and learning.

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