Comparative Analysis of Cognitive Competence Among Pupils and Students in Abia State, Nigeria

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ABSTRACT This study determined the cognitive competence of pupils and students in Abia State, Nigeria. Cross-sectional developmental survey was the design used for the study. The sample consisted of 360 pupils and students from primary five, JS II and SS II. The instrument used for data collection was a researcher-developed Cognitive Competence Test (CCT). Means and standard deviation were used to answer the research questions while ANOVA was used to test the null hypotheses. The result of the study showed that cognitive competence did not continue to increase steadily with higher levels in education or class. Gender had no significant influence in predicting cognitive competence of pupils and students in Abia State.

1. Introduction

The general expectation of every society is to see her children develop in such a successive manner that their cognitive competence will march each stage of development. Studies in child development attest that there are remarkable changes in physical, social, moral and cognitive domains of children as they advance from these stages: infancy – childhood – adolescence – adulthood (Case, 1985; Goswami, 2002). Child development refers to the biological, cognitive and socio-emotional changes that occur in human beings between birth and the end of adolescence as the individual progresses from dependency to increasing autonomy (Wikipedia Encyclopedia, 2009).

1.1 Conceptual Definition
1.1a Cognitive development

Cognitive development, an aspect of child development, is the construction of thought processes, including remembering, problem solving, and decision-making from childhood through adolescence to adulthood (Peterson, 2008; Children's Health Encyclopedia, 2009). In addition, cognitive development refers to how a person perceives thinking and gains understanding of his or her world through the interaction of genetic and learned factors. Learned factors here are socially created symbol systems such as language, writing and number systems, which vary from one society to another. Piaget (1983) asserts that cognitive development consists of a number of structural stages. By stages, he meant invariantly sequenced, qualitatively distinct levels that can meaningfully characterize developmental sequences of abilities across domains. Each of these stages forms a developmental sequence that is characterized by qualitative re-structuring, hierarchical integration, sophisticated and abstract levels of thought (Bjorklund, 1995; Pulaski, 1980). Some of the main domains of cognitive development are information processing, intelligence, reasoning, language development and memory development. However, since these domains require some mental and observable actions, an individual may face with the challenges of competence or incompetence in cognitive tasks at a stage in development.

1.1b Competence and Cognitive

The word "competence" is a direct derivative of the Latin word "competere", literally meaning "competing', an adjective indicating that one is able to engage in a competition (Encarta English Dictionary, 2009). In essence, the word – competence presupposes an action, a form of activity, not a state. Goldfried and D'Zurilla, (1961) defines competence as the effectiveness or adequacy with which an individual is capable of responding to different problematic situations; while Sternberg and Kolligan, (1990) defined it as a measure of ability, whether the observable performance of a person represent their underlying traits or capacity. In another perspective, Perrenoud (2000) defined competence as a capacity to mobilize diverse cognitive resource to meet a certain type of situation. In essence, the exercise of competence involves complex mental situations and schemes of thought which allow a performance of action which is relatively adapted to a situation. On the other hand, the word "cognitive" is the adjectival form of the word "cognition". It is concerned with the acquisition of knowledge; relating to the processes of the use of reasoning, intuition and perception.

1.1c Cognitive competence

Cognitive competence is the degree of success in functioning within a specific environment with apparent discrepancy in age related trends (Birren and Schaie, 1990). Cognitive competence connotes the ability to carry out mental activities and process information as each stage of development demands (Nwachukwu, 2000). Furthermore, Wylie and Hodgen (2007) discussed cognitive competence as it applies to numeracy, literacy, logical problem solving, social and attitudinal skills. According to Nwachukwu (1995), cognitive competence can manifest in the form of fluency of language, literacy, well developed memory strategies, reasoning and problem solving. However for Wylie, Ferral, HOdgen and Thompson (2006), cognitive competence can be measured in reading, writing, comprehension, and mathematics, standard progressive matrices tasks, rating of core subjects, communication, social skills and self-management. The researchers operationally define cognitive competence as the ability to perform and carry out measurable skills in language, mathematics and moral reasoning tasks as developmental stage

and age demands.

1.1d Developmental tasks periods
Changes which manifest in an individual's thought, intelligence, reasoning and language as a result of development go with developmental task at each stage. A developmental task is a task which an individual has to and wants to tackle in a particular life period (Havighust, 1952). Havighust opined that the process of living from birth to death consists of people working their way through from one stage of development to another by solving their problems in each stage. He identified six major age periods and presented typical developmental tasks for each of these periods from infancy to later maturity period. In a similar manner independent studies carried out by Piaget (1952) and Kohlberg (1958), showed that there were different stages of cognitive and moral development. Each of these stages goes with a measure of a developmental requirement or task which an individual has to accomplish at a given stage and age. A stage is a period of time, often associated with a known chronological age range, during which a behavior or physical characteristics is qualitatively different from what it is at other ages. It is assumed that developmental change runs parallel with chronological age; age itself cannot cause development. Findings of accomplishment of many developmental tasks indicate typical chronological ages associated with developmental milestones (Cole 1986; Goetting, 1986). Milestones are changes in specific physical and cognitive abilities such as walking, understanding language, moral reasoning and calculation that mark the end of one developmental period and the beginning of another.

1.1f Gender role and cognitive competence
The researchers, however from their observation and interaction with some students in Abia state at different developmental stages perceived a gross decline in cognitive competence and moral reasoning ability as the students advance in age and successive classes in school. Another issue of research importance in this study is that of gender. There is a considerable literature on the idea that gender may influence cognitive competence and moral reasoning (Bussey and Bandura, 1999; Galligan 1982). From the moment of birth, a child's gender influences the opportunities he or she will experience. Within a few years of life, children begin to form their own ideas about gender that subsequently guide the types of activities they practice, what they find interesting and the achievements they attain. These activities reflect and perpetuate gender roles and stereotypes in the society (Wood and Eagly, 2002).

There are seemingly gender differences in computational tasks, verbal skills and mathematics and conceptual abilities. However, while many studies (Linn and Hyde, 1989; Beller and Gafni, 1996) conclude in favor of males over females in cognitive competence and moral reasoning, others submit that females perform better than males in cognitive competence and moral reasoning tasks. According to Nowell and Hedges (1998), science and math are the academic areas in which boys have historically done better than girls in North America. However, gender differences in maths and science have narrowed over the recent years. Hyde (2004) believed that the cognitive difference between females and males has been exaggerated. In addition, Hyde points out that there is considerable overlap in the distribution of males and females scores on math and visual-spatial task. Kohlberg (1982) opined that there is a gender difference in moral reasoning. He suggested that females operated at lower levels of moral development than their male counterparts. However, Mundy-Castle and Bundy (1988) in another study concluded that there is no significant difference in males and females in moral reasoning. Independent studies on the influence of gender on cognitive competence and moral reasoning seemingly points to an indecisive conclusion while the debate lasts.

2. Statement of the Problem
It has been established through studies in human development that there are changes in a child's cognitive domain as they advance from infancy to adolescence. These changes are also accompanied by qualitative performance in reasoning, thinking, judging, evaluating, and decision-making. However, the researchers' classroom experience elicits much doubt whether students in Abia State, Nigeria respond to these changes in their cognitive competencies and moral reasoning at lower classes in school or at higher classes in accordance to their developmental demand in age and academic exposure. A comparative analysis of cognitive competence among different classes of students in Primary 5, JS-2, and SS-2 will yield data on how these facets of developments compared among the children. In essence, what is the cognitive competence of pupils in Primary 5 and students in JS-2 and SS-2?

Furthermore, it has been established that gender seemingly influences an individual's cognitive competence. Studies in the influence of gender on cognitive competence have not been explored across Primary 5, JS-2 and SS-2 classes in Abia State, Nigeria. Therefore, the influence of gender on Cognitive competence of pupils in Primary 5, and students in JS-2 and SS-2 classes is also explored in this study.

Research Questions
1. What is the cognitive competence of pupils and students in Abia state?
2. What is the influence of gender on cognitive competence of pupils and students in primary 5, JS-2 and SS-2 respectively?

Hypotheses
HO 1: There is no significant difference between the mean cognitive competence scores of pupils in primary 5 and students in JS-2 and SS-2.
HO 2: There is no significant difference between the mean cognitive scores of male and female re spondents.

3. Method
The design of the study was cross-sectional developmental survey. The population of this study consisted of all the pupils in primary 5, students in JS-2 and SS-2 classes in public schools in Umuahia North Education Authority. The choice of students in Umuahia North Education Authority was because the schools are located within the capital city and its suburbs where the schools are monitored for efficient academic exposure and moral conduct. Furthermore, there were sixteen (16) Senior Secondary Schools, seventeen (17) Junior Secondary Schools and sixty-four (64) primary schools in Umuahia North Education Authority. There were 2755 students in SS-2, 4041 students in JS-2 and 2580 primary five pupils in the above education authority (SEMB; ASUBEB, Umuahia North LGEA, 2009). The sample of this study was 360 students, (120 students in SS-2; 120 students in JS-2; and 120 pupils from primary five).

Simple random sampling technique was employed. Eight schools each were randomly selected from 16 Senior Secondary schools and from 17 Junior Secondary Schools respectively in Umuahia North. Furthermore, 15 students were randomly selected from each of the 8 classes. Similarly, 20 primary schools were randomly selected from 64 primary schools in Umuahia North. Six pupils in Primary five were randomly selected from each of the selected 20 primary schools (making 120 pupils).

3.a. Instrument for Data Collection
The instrument was Cognitive Competence Test (CCT). The test comprised two components: English and Mathematics. Each component had a set of 20 items of multiple choice questions for primary 5 pupils, JS-2, and SS-2 students, respectively. Each set marched the cognitive developmental

level of the pupils and students. The instrument was face validated separately by one expert in Educational Psychology, two experts in Measurement and Evaluation, an English teacher and a Mathematics teacher. The reliability of each set of the instrument was ascertained using test-retest data from a pilot study. For the English sets, the reliability coefficients were: .88; .84; and .85 for primary five; JS-2; and SS-2 sets respectively. For the mathematics sets, the reliability coefficients were: .93; .88; and .86 for primary five; JS-2; and SS-2 sets respectively.

The researchers administered the test personally. The tests (scripts) were retrieved immediately after administration at an agreed period that was relative to each school. The mean scores of each group were calculated along the standard deviation. Each of the tests (Mathematics, English) had a maximum score of 100% and the mean scores were used a pupils'/students' cognitive competence score.

Data were analyzed using means, standard deviation, student-t and analysis of variance (ANOVA) statistics.

4. Results
The result of the study is presented thus;

Table 1: Mean scores and standard deviation of cognitive competence by class

Class	Mean	N	Std. Deviation
Pupil	78.8750	120	14.74236
JSII Students	69.8500	120	13.21868
SSII Students	57.0083	120	12.70512
Total	68.5778	360	16.25406

Data on Table 1 indicate the cognitive competence of pupils and students in Abia state. From this table, it is shown that the pupils had a cognitive competence mean score of 78.87 and a standard deviation of 14.7. The mean scores in the cognitive competence of students was 69.85 with a standard deviation of 13.21 while the mean score on cognitive competence of SSII was 57.00 and a standard deviation of 16.25.

The indication is that the cognitive competence of primary 5 pupils is higher than that of students in JS II and SS II respectively while the cognitive competence of JS II students is higher than that of SS II students.

Table 2: Mean scores and standard deviation of cognitive competence by gender.

Gender	Mean	N	Std. Deviation
Male	49.8316	196	16.33361
Female	69.4695	164	16.16306
Total	58.5778	360	16.25406

The results in Table 2 above show that the mean score for all the 196 male respondents from primary 5, JS II and SS II is 49.83 in cognitive competence with a standard deviation of 16.33 while that of all the 164 female pupils and students from primary 5, JS II and SS II was 69.47 with a standard deviation of 16.16. The indication is that the female pupils and students have a higher cognitive competence than the male pupils and students.

Table 3: Summary of the t-test of the mean cognitive competence scores of male and female pupils and students

	Levene's Test for Equality of Variance		t-test for equality of means						95% Confidence Interval of the Difference	
	F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error difference	Lower	Upper
Cognitive Competence Equal variances Assumed	.058	.810	-4.952	358	.013	-1.63788	1.72036	-5.02116	1.74541
variances Not assumed	.058		-.953	348.113	.341	-1.63788	1.71875	-5.01833	1.74257

From the Table 3 above, the significant value is .013. Since the significant value is less than .05, the level of significance at which the hypothesis was tested, the null hypothesis is rejected. The researchers hereby conclude that there is a significant difference between the mean cognitive competences of male and female respondents.

Table 4: Summary of one way analysis of variance

	Sum of squares	df	Mean square	F	Sig.
Between Groups	28980.406	2	14490.203	78.539	.000
Within Groups	65865.417	357	184.497		
Total	94845.822	359			

Table 4 shows that there is no significant difference between the mean cognitive competence of pupils and students is primary five, JSS 2 and SS 2 respectively. The result of the analysis of variance (ANOVA) shows that the significant value of 0.00 is less than .05 level of significance at which the hypothesis was tested. Therefore, the null hypothesis is rejected. The researchers concluded that there is significant difference between the mean responses of the pupils and students (primary five, JS II and SS II) on their cognitive competence, as a result of this significant value, a further test was carried out to ascertain which of the categories of the respondents contributed more significantly than others.

Table 5: Duncan's Post Hoc Tests for Homogenous Subsets.

		Subset for alpha = .05		
Class	N	1	2	3
SSII Students	120	57.0083		
JSII Students	120		69.8500	
Pupil	120			78.8750
Sig.		1.000	1.000	1.000

Mean for groups in homogenous subsets are displayed

a. Uses Harmonic Mean Sample Size = 120.000

The post hoc affirmative test reveals that the primary five pupils contributed most significantly, followed by JS II students while the SS II students contributed least significantly.

4.1 Discussion
4.1a Cognitive competence of pupils and students in primary five, JS II and SS II
The results showed that primary five pupils have highest mean score in cognitive competence, followed by JS II students and SS II students. Havighurst's developmental tasks, an off shoot of Piaget's theory, were considered in designing the instrument that was used in collecting data for this study. However, the result negates Piaget's theory on cognitive de-

velopment and aligned itself with neo-Piagetian theories.

Piaget (1983) pre-supposes a four distinct, universal stages and each stage is characterized by increasingly sophisticated and abstract levels of thought occurring in the same order, building in what was learned in previous stage. Neo-Piagetian theories of cognitive development concluded that development does not always progress in smooth manner as Piaget seems to predict (Demetriou, 1998). Further, they consider cognitive factors of development as intra-individual and inter-individual differences. This suggests that some other personality factors might be impacting on cognitive competence of the subjects. Such factor may include health status, socio-economic background of parents, personal interest and effort. Petterson (2008) opined that developmental advances in cognition are also related to experience and learning and this is particularly the case for higher-level abilities like abstraction, which depend to a considerable extent on formal education. It has also been suggested that transition from primary school to secondary school level in the educational ladder is accompanied by significant disruption of identity and self-concept (Melgosa, 2000). In primary school, the pupil is in close contact with a single class teacher whereas in the secondary school, more subjects and more teachers are experienced. Added to this is the fact that secondary school levels coincide with the onset of puberty and its accompanying changes in socio-emotional and physical characteristics. It might be that the cumulative effect of these personality disrupting variables is a down slide in cognitive competence as observed in this study.

4.1b Influence of gender on cognitive competence of pupils and students
Results indicated that the mean cognitive competence score of the females was 69.47 against 49.83 of males. This result above strongly supports the women's Equity Act of the U.S.

Department of Education on the "Unpredictability of gender" (Campbell 1994). In essence, the assumption that males perform better than females in cognitive tasks appears not to be supported by the finding of this study. Petterson (2000) similarly submitted that boys and girls show some differences in their skills and preferences but there is a great deal of overlap between the groups. As such, differences in cognitive competence of different ethnic groups appear to result from cultural or other environmental factors. Nzewi (2010) reported several studies to aver that gender does not absolutely just by itself alone control achievement.

5. Conclusion
The general purpose of this study was to determine the cognitive competence of pupils and students in Abia state metropolis. Major finding s of the study include: cognitive competence does not steadily increase with higher level in education; gender influences cognitive competence in an unpredictable manner. The above results suggest that: teachers should create a supportive classroom environment that will enhance cognitive competence by paying due attention to individual differences. Curriculum developers should present books that will stimulate higher cognitive competence as pupils and students advance in classes. Educators should be sensitive to gender issues in handling the boy child and the girl child. In essence, labeling one as inferior to the other due to over-riding cultural belief is no more tenable.

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