

# **STUDENTS' COGNITIVE STYLE, COGNITIVE DEVELOPMENT AND COGNITIVE DEMANDS OF SECONDARY SCHOOL PHYSICS CURRICULUM AS FACTORS AFFECTING ACHIEVEMENT IN PHYSICS**

**BY**

**EMMANUEL EDOJA ACHOR**

**PhD Thesis, Faculty of Education, University of Nigeria, Nsukka. September,  
2001.**

The purpose of the study was to determine whether there is any relationship between measures of student's cognitive style, cognitive development, cognitive demands of secondary school (SS) physics curriculum and student achievement in physics. Four research questions were generated and four hypotheses formulated to guide the study. The design of the study was correlational. The population of the study was 2290 SS2 physics students in Kogi State of Nigeria for 2000/2001 academic session. Purposive and non equivalent stratified random sampling techniques were used to obtain a sample of 524 students from six education zones in the state. Four instruments were used for data collection. They include Group Embedded Figures Test (GEFT) for measure of cognitive style, science reasoning task (SRTs) for measure of cognitive development, Curriculum Analysis Taxonomy (CAT) for determination of cognitive demands of the curriculum and Physics Achievement Test (PAT) for the determination of students' achievement in physics. GEFT and SRTs were adopted and adapted respectively in the study for data collection. Curriculum Analysis Taxonomy (CAT) and Physics Achievement Test (PAT) constructed by the researcher were face and content validated using 14 physics educators two of whom were evaluators. CAT has inter-rater reliability coefficient of .89 and mean inter-rater scale of 3.4. PAT has inter-rater reliability coefficient of .91, mean inter-rater scale of 3.4 and internal consistency reliability coefficient of .83. Multiple regression and correlation statistical techniques were used for data analysis to answer the research questions and to test the hypotheses. Major findings from the study among others include:

1. Measures of students' cognitive style and cognitive tasks were significant predictors of students' achievement in physics.
2. Only measure of student's cognitive style was a significant predictor of student's achievement in high order cognitive demand questions in physics.
3. Measures of students formal reasoning was neither a significant predictor of students' achievement in physics nor students achievement in higher order cognitive demands questions in physics and there is therefore a mismatch between the dependent and the independent variables.
4. There were significant relationships between students' achievement in 2A cognitive demand level questions in physics and in each of 2A, 2B, 3A and 3B cognitive demand levels in physics.
5. The means and standard deviations for students achievement in each of the four cognitive demand level questions in physics (that is, 2A, 2B, 3A, and 3B) as well as correlations in their achievements between 2A demand level and each of 2A, 2B, 3A and 3B demands decreased with increasing demand levels.
6. There was a significant relationship between students' achievement in lower order and higher order cognitive demand questions in physics.

Based on the findings and conclusions, educational implications of the study were highlighted. Recommendations were made especially that there should be a national curriculum review in physics based on the Curriculum Analysis Taxonomy (CAT) carried out with the hope of making it less formal reasoning loaded. Also that materials and activities within school system should be organized to help low scorers in measure of cognitive style and low formal operational students learn and improve meaningfully.