

1. TITLE: Cognitive Skill Achievement of College Freshmen Using Piaget's Logical Operators in Mathematics

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6. ABSTRACT OF THE PAPER:

Cognitive Skill Achievement of College Freshmen Using Piaget's Logical Operators in Mathematics

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ABSTRACT

An alarming observation of Filipino students reveals that they excel in knowledge acquisition but fare considerably low in problem solving activities requiring higher order thinking skills. This sorry state is evident in the performance of students in national and international surveys on mathematics and science competencies. Even studies on the thinking processes of pre-service teachers conducted in a teacher training state university in the Philippines drew the same picture about our students (Philippine Daily Inquirer, 1988).

Gathering evidences of the problem help educators find ways to remedy the situation. Since changing times require schools to develop critical, creative and independent thinkers, definite action have to be taken even at the classroom level. Diagnosis of the process skills of students has to be undertaken by teachers to help them get a profile of their students and identify their needs.

Teachers should maintain the development of cognitive skills as the central goal of their instruction. They should be able to design a curriculum that allows students to develop their process skills that lead to expertise in problem solving. They should be able to create an environment that nurtures the capabilities of students and develops their potentials to the fullest.

Expert problem solvers are thinking individuals who can observe, classify, measure, communicate, predict, interpret, analyze, synthesize, deduce and infer. They can see, organize and make sense of every information given in a problem situation through reflective abstraction (Limjap, 2002). They possess the process skills needed to systematically engage in any mathematical task. College freshmen are expected to possess these process skills as they tackle the course in Algebra.

This descriptive empirical research investigates the cognitive skill achievement of college freshmen using Piaget's seven logical operations in Mathematics namely: Classification, Seriation, Compensation, Logical Multiplication, Ratio or Proportional Thinking, Probability Thinking and Correlational Thinking. Specifically, this study is

designed to find out the students' level of cognitive performance. This study determines the reasoning patterns exhibited by the respondents as they engaged in the Test of Logical Operations (TLO) in Mathematics, and responded to the interview.

Reliability of the instrument was established through internal-consistency method and estimated through Kuder-Richardson Formula 20. Item analysis was also done to determine the difficulty level and discrimination index of each item of the instrument. Face, content and concurrent validity of the instrument were also established.

Respondents of the TLO were fifty-nine (59) college freshmen taking up Bachelor of Science in Education and associate course in Computer Technology and enrolled in College Algebra during the first semester of the school year 2001-2002 at the Bataan Polytechnic State College, Balanga Campus, Bataan province, Philippines. The interview was conducted to sixteen (16) randomly selected students among the TLO respondents. This follow up interview provided information about the reasoning patterns of the students. The Schoenfeld Scoring Continuum was used to evaluate the TLO while the Raven's Reasoning Categories was used to classify the reasoning patterns of students as they responded to the interview protocol.

Descriptive statistics particularly mean of scores, frequency, percentages and ranks were used to describe the performance of students in the TLO. The adequacy of reasoning patterns was quantified to further analyze the data. This was particularly applied to determine the general reasoning pattern of students divided according to their sublevels of cognitive skill and achievement.

Majority of the student respondents who are expected to perform at the formal operational level, performed only at the concrete operational level.

Student respondents gave adequate reasons for their answers in the Test of Logical Operations in Mathematics on the following operations namely: Classification, Seriation, Compensation, Logical Multiplication, Ratio or Proportional Thinking, Probability Thinking and Correlational Thinking. They gave ambiguous reasons on problems requiring Ratio or Proportional Thinking.

This study shows that cognitive development is one of the many factors that affect learning mathematics. This further shows that the reasoning abilities are significantly related to cognitive skills achievement in Mathematics. Results indicate that as students raise their cognitive skill achievement to higher levels, their reasoning patterns develop successively and progressively.