

Problem Solving in Mathematics Education: A Case Study of Nigerian Secondary School Mathematics Teachers' Conceptions in Relation to Classroom Instruction

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Abstract : Mathematical problem solving has long been accorded an important place in mathematics curricula at every education level in both advanced and emerging economies. Its classroom approaches have varied, such as teaching for problem-solving, teaching about problem-solving, and teaching mathematics through problem-solving. It requires engaging in tasks for which the solution methods are not eminent, making sense of problems and persevering in solving them by exhibiting processes, strategies, appropriate attitude, and adequate exposure. Teachers play important roles in helping students acquire competency in problem-solving; thus, they are expected to be good problem-solvers and have proper conceptions of problem-solving. Studies show that teachers' conceptions influence their decisions about what to teach and how to teach. Therefore, how teachers view their roles in teaching problem-solving will depend on their pedagogical conceptions of problem-solving. If teaching problem-solving is a major component of secondary school mathematics instruction, as recommended by researchers and mathematics educators, then it is necessary to establish teachers' conceptions, what they do, and how they approach problem-solving. This study is designed to determine secondary school teachers' conceptions regarding mathematical problem solving, its current situation, how teachers' conceptions relate to their demographics, as well as the interaction patterns in the mathematics classroom. There have been many studies of mathematics problem solving, some of which addressed teachers' conceptions using single-method approaches, thereby presenting only limited views of this important phenomenon. To address the problem more holistically, this study adopted an integrated mixed methods approach which involved a quantitative survey, qualitative analysis of open-ended responses, and ethnographic observations of teachers in class. Data for the analysis came from a random sample of 327 secondary school mathematics teachers in two Nigerian states - Anambra State and Enugu State who completed a 45-item questionnaire. Ten of the items elicited demographic information, 11 items were open-ended questions, and 25 items were Likert-type questions. Of the 327 teachers who responded to the questionnaires, 37 were randomly selected and observed in their classes. Data analysis using ANOVA, t-tests, chi-square tests, and open coding showed that the teachers had different conceptions about problem-solving, which fall into three main themes: practice on exercises and word application problems, a process of solving mathematical problems, and a way of teaching mathematics. Teachers reported that no period is set aside for problem-solving; typically, teachers solve problems on the board, teach problem-solving strategies, and allow students time to struggle with problems on their own. The result shows a significant difference between male and female teachers' conception of problems solving, a significant relationship among teachers' conceptions and academic qualifications, and teachers who have spent ten years or more teaching mathematics were significantly different from the group with seven to nine years of experience in terms of their conceptions of problem-solving.

Keywords : conceptions, education, mathematics, problem solving, teacher

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