

## **Metacognition and Mathematical Problem Solving – Teaching and Learning at the Primary Levels [MetaMaps (Primary)]**

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### **KEY IMPLICATIONS**

- Primary mathematics teachers need to be provided with an operationalised definition of metacognition for teaching and learning of mathematics.
- Primary mathematics teachers need to be equipped with some metacognitive instructional strategies to foster metacognition in their mathematics classrooms.

### **BACKGROUND**

Given the research which strongly links metacognition to success in problem solving and the role which metacognition plays in preparing our students for the 21st century as well as the fact that metacognition has been featured in the Singapore School Mathematics Curriculum for more than 20 years, there is a need to examine how metacognition is being addressed in the mathematics classrooms.

### **FOCUS OF STUDY**

This study aimed to gain insights into Singapore mathematics teachers' conceptions of metacognition and metacognitive instructional practices, which could then serve to aid future research in developing more appropriate survey instruments to better identify possible gaps in the teachers' metacognitive instructional practice. Data were collected using survey and triangulated with lesson observations and interviews.

### **KEY FINDINGS**

Teachers were found to confuse metacognition with other thinking processes and teaching approaches. There was a lack of precision in their understanding of metacognition and most cited it as "thinking about thinking".

In terms of metacognitive instructional practices, though some teachers had some understanding of metacognition (i.e., reflection, monitoring of thinking) and some cited their own practice in metacognition, there was no explicit nor systematic practice of fostering metacognition in students.

### **SIGNIFICANCE OF FINDINGS**

#### **NIE Programmes and Practice**

Given teachers' confused conception of metacognition and vague practices of fostering students' metacognition, there is a need to address these both at the pre- and in-service course levels. The development of the in-service course IME1040 (Promoting Metacognition in Primary School Children) and the restructuring of the in-service course IME2055 [Metacognition in the (Secondary) Mathematics Classroom] to address teachers' conception of metacognition and equipping teachers with some metacognitive instructional strategies have received very positive feedback from the participants in these aspects.

## Curriculum

Given that metacognition is featured as part of the Singapore School Mathematics Curriculum Framework for more than 20 years and the lack of clarity among teachers in addressing this part of the curriculum, there is a need to better explicate this construct and its related issues in the revision of the curriculum. Based on the findings of the study, both the PI and one of the co-PI, Senior Maths Curriculum Specialist Dr Loh, provided feedback to the Maths Unit, CPDD, MOE on revising and refining the metacognition aspect of the Singapore School Mathematics Curriculum Framework during the recent review of the Secondary mathematics curriculum.

## Policy

In relation to the above contribution to curriculum, there also appeared to be a need to place a greater emphasis on metacognition in the next round of review of the Singapore primary mathematics curriculum to better address this gap in the curriculum.

## POPULATION

This exploratory study targeted six primary mathematics teachers, one from each of the six levels, each from a convenient and purposeful sample of three primary schools, which represented a good mixed of schools in Singapore.

## RESEARCH DESIGN

This proposed exploratory study adopted a mixed method, which involved the development and employment of surveys that capture teachers' conceptions of metacognition in mathematical learning, and the data obtained was triangulated with those obtained from lesson observations and interviews of some teachers. The methodology used was one of a multi-site, multi-case-based qualitative study. The study targeted 6 primary mathematics teachers, one from each of the six levels, each from a convenient and purposeful sample of three primary schools, which represent a good mixed of schools in Singapore. The data collected was analysed using grounded theory development to work towards the development of a theoretical framework to better position the conceptions of metacognition and metacognitive instructional practices of the teachers.

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