Traditional Mathematics Education vs. Realistic Mathematics Education: Hoping for Changes

Ahmad Fauzan, Padang State University, Indonesia
Dick Slettenhaar, Twente University, The Netherlands
Tjeerd Plomp, Twente University, The Netherlands

Introduction

There is a number of problems in geometry instruction at primary school in Indonesia. For example, the approach that is used to teach geometry topics is very theoretical, and many abstract concepts and formulas are introduced without paying much attention on aspects such as logic, reasoning, and understanding (Karnasih & Soeparno, 1999; Soedjadi, 2000). The topics that are taught seem very far from pupil's daily life. Therefore most pupils think that geometry is very difficult to learn (Soedjadi, 1991; Kerans, 1994; Fauzan, 1998). In addition, the teaching learning-process is always organized in a traditional (teacher centered) way (Somerset, 1997).

In general, the climate in Indonesian classrooms is similar to those in several African countries as was summarized by de Feiter at all. (1995) and Ottevanger (2001) as follow: pupils are passive through out the lesson; 'chalk and talk' is preferred teaching style; emphasis on factual knowledge; questions require only single words, often provided in chorus; lack of learning questioning; only correct answers are accepted and acted upon; whole-class activities of writing/there is no hands work is carried out.

In our research project (started in 1998) we explored the extent to which Realistic Mathematics Education (RME) could address some of the problems in mathematics education in Indonesia, more specifically in the geometry instruction.

Realistic Mathematics Education (RME)

RME is an approach in which mathematics education is conceived as human activity (see Freudenthal, 1973; Treffers, 1987; Gravemeijer, 1994; De Lange, 1987, 1998). In RME, learning mathematics means doing mathematics, of which solving every day life problems (contextual problems) is an essential part. Other key principles are that student should be given the opportunity to reinvent mathematical concepts, and that the teaching-learning process be highly interactive.

Given these characteristics, RME is considered a very promising approach to improve mathematics teaching and to make it not only more relevant for pupils in Indonesia but also to change the classroom' climate. To explore whether and under what conditions RME as an approach can be utilized in

Indonesian primary schools, a series of 10 lessons have been designed on the topic 'area and perimeter'.

The potential of RME-based lessons as compared to traditional geometry lessons are twofold. Firstly, the Indonesian curriculum for primary school contains only the most minimal concept of area, namely area as "length times width' or area as counting the squares centimeters in a rectangle or square. In the RME-based lessons the concept of area could be broadened to other shapes, by relating 'area' to other 'magnitudes' (such as costs, weight, paint, rice filed, cake, etc.); investigating the relation between area and perimeter; connecting measurement units to reality; integrating some geometry activity (re-shaping, tessellation, etc.). Secondly, RME-based lessons would create the teaching-learning situations allowing for pupils- centered instruction, active learning (interactivity), free production (reinvention and self-developed models), etc. (see De Lange, 1987; Streeflands, 1991; Gravemeijer, 1994). The principle of 'free production' would stimulate pupils' reasoning because in solving a problem pupils have to share or discuss concepts they reinvent or models they develop.

Research design

The research reported here has an exploratory character, and it was conducted in two primary schools in Surabaya (East Java). As no teacher in Indonesia has experience with teaching RME-based lessons the first author taught the pupils himself with the teachers and the second author taking the role of observers. The data collection focused on pupils' activities and- reactions when they dealt with the RME-approach. The instruments used to collect the data were an observation scheme, logbook and interview guidelines. The data analysis was qualitative and judgmental.

Research findings

There were many obstacles found when the pupils, who were used to the traditional way of teaching, dealt with the new approach (RME), such as the very dependent attitude of the pupils, the pupils not being used to working in groups, lack of reasoning capability, and lack of understanding of basic concepts. Nevertheless, this first pilot with RME had many positive impacts on the teaching-learning process. The difference in the learning behavior of the pupils found from day to day showed that RME is a potential approach for teaching and learning mathematics. The interviews with a number of pupils showed that pupils like the new approach. They realized that there were some positive changes on themselves especially in reasoning, and being more active and creative. The teacher themselves (who acted as observers) admitted that there were positive changes on the pupils' behavior after they dealt with RME-based lessons.

In conclusion, RME is an approach to mathematics education developed in the Netherlands, but the exploratory research reported here shows that this

approach is not something impossible to utilize in Indonesia. But to realize this, -a big effort is needed in the areas of curriculum development, assessment practices, and teacher (in-service) training-, all these supported by focused development research and formative evaluation to assure that 'local' relevancy will be obtained. The efforts needed should not be underestimated as the change touches on the roots of mathematics education in Indonesia: it is necessary that all stakeholders understand that not only a new curriculum and a new pedagogy is needed, but above all that the notion of what is good mathematics education has to change (see Fullan, 1991). Therefore, a process of change of the mathematics curriculum and culture towards introducing RME in Indonesia is only possible with the support of the government and of key mathematics educators. The government has to play an important role, in the first place by providing the budget that is needed to facilitate the research and development in all three areas mentioned above. So a key priority is to develop a policy on mathematics education that provides the formal and 'administrative' support that such a change of the national curriculum and assessment approach needs. Given the key role teachers have to play such an innovation, the teacher training institutes may become the first "targets' for change, as they have to play a central role in preparing teachers capable of teaching and disseminating RME.

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