

Abstract Number: 20398

Using Picture Books to Enhance Students' Mathematics Learning in Primary School

Qiaoping Zhang, *The Chinese University of Hong Kong*

WingYing Yeung, *Fung Kai No.1 Primary School*

ShukPing Cheung, *Fung Kai No.1 Primary School*

Learning mathematics takes place when children are given the opportunity to reconstruct mathematical objects in a meaningful way. Children's picture books can present a context that allows students to experience real-life situations and incorporating children's storybooks into mathematics instruction helps children experience the potential wonder of mathematics. Positive effects were found not only on children's performance in mathematics but also on their interest in learning mathematics and attitudes they developed toward mathematics. Recently, the Curriculum Development Council in Hong Kong has proposed that mathematics teachers be encouraged to help students transfer literacy skills and strategies to the learning of mathematics. Learning to read in mathematics becomes a key area in Hong Kong mathematics curriculum. In previous research, suggested integrations of children's picture books into mathematics lessons were mainly realized in the context of the stories or related mathematical concepts. Students' ability and needs were seldom emphasized.

Considering students' learning difficulties, their misconceptions of mathematics together with the knowledge structure presented in school mathematics curriculum, the current study reported a spiral approach to integrate picture books into mathematics lessons in a Hong Kong primary school. A series of school-based picture books were designed for primary students (from grade 2 to grade 5) to facilitate students' understanding of mathematical knowledge and daily-life applications. These books were all about the topic of fraction. Three teaching stages were set up to implement the integration. They were preview reading stage, classroom teaching stage, and after class extension stage. Flipped learning was used at the first stage, which included the introduction of a related story and mathematical knowledge. A teacher-led yet student-centred approach was adopted at the second stage, which included reviewing story, creating story conflicts, group discussion, shaping learning objectives and consolidation. At the final stage, a study journal was used to sort out the learning content. Students were also encouraged to create their own stories. A questionnaire survey found that, including the improvement of the performance test, the students' confidence in mathematics and attitude towards mathematics improved. Their anxiety level in mathematics reduced too. The classroom observation and semi-structured interviews showed that students had more interest in learning mathematics and more eagerness in engaging in the classroom activities.

Abstract Number: 20174

Exploring Subtraction Tasks, On the Basis of Relationships, Also When Negative Numbers are Involved

Charlotta E.A. Andersson, *Stockholm University*

Jane Tuominen, *Stockholm University*

The issue of this presentation is to highlight, if and in what way, a learning model can ‘five access’ to subtraction tasks when negative numbers are involved.

When mathematics teaching is based on specific numbers, calculations, procedures, memory rules as well as metaphors or when exploring mathematics empirically challenges are shown in the teaching (e.g. Davydov, 2008; Kieran, 2004; van Oers, 2001). Challenges and difficulties regarding subtraction and negative numbers are highlighted and defined by previous research (e.g. Ball, 1993; Kilhamn, 2011) and confirmed by reports from TIMSS (Skolverket, 2016). This was also experienced by the teachers, teaching in grade 1-3 respectively 7-9, collaborating in two parallel projects together with researchers. In the two projects similar object of learning were explored and due to the collaboration between the groups, discussions regarding similarities and differences between the grades and how to design teaching, based on general strategies, could be carried out.

Learning study with its iterative process was used as arrangement for the research projects. The variation theory was used in order to design pre- and post tests and research lessons, and for analyzing them (Marton, 2015). Further, the researchers and teachers were inspired by Davydov’s curriculum, developed in Russia where mathematics is introduced, based on general mathematical structures, in particular relationship between the numbers in a task with additive structures. Teachers and students following Davydov’s curriculum construct a learning model in order to visualize the relationship between the numbers (e.g. Davydov, 2008; Dougherty, 2004).

In the research projects, it was decided to stretch the use of the learning model described in Davydov’s curriculum, also to including negative numbers, which seems to be quite unexplored.

A tentative finding indicates that what the students regardless grade needed to discern and learn were similar. We also found that the students, with support by the learning model, got Access’ to subtraction tasks involved negative numbers. Examples of tasks: $3 + x = 2$ (for students in grade 3) and $x - (-15) = (-14)$ (for students in grade 9). The students were enabled to identify general mathematical structures and the relationship between the numbers in a task and to choose an appropriate operation for a subtraction task with negative numbers involved, an operation, which not always was subtraction.

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Abstract Number: 20359

11th Grade Student's Mathematical Creativity in Mathematics Classroom Using Lesson Study and Open Approach

Pitipong Wiriyapornprapas, *Khon Kaen University*

Duanpen Jarujit, *Khon Kaen University*

Skills necessary for the 21st century influenced in educational paradigm change. Educational all levels emphasized on their' higher order thinking skills, such as creative thinking (The Partnership for 21st Century Skills, 2011) Nevertheless, most mathematic classes in Thailand haven't focused on mathematical learning processes but emphasized on contents and doing exercises. Traditional mathematic classroom is prevalent teachers' teaching script begins with explaining new content, providing some examples, and ending with assigning students some exercises. Unfortunately, most exercises are closed problems, which have one and only one correct answer (Inprasitha, 2015b). Closed problems have clear source and purposes but without various possible ideas recognition which the one aspect of creativity (Guildford, 1950 ;1967 ,cited in J.S. Park et.al 2006) various ideas about a problem solving with different aspects thinking. The problem that caused various concepts is opened-ended problems.

Open-ended problems in Thailand was firstly applied by Maitree Inprasitha et.al in 2002 as 'Problem Situation' in order to be the proper learning matters conduct motivation of Open Approach innovation. The learners whom applied Open Approach would attempt to find the proper answers therefore during the solving processes the learners would be able to have the new solving experiences(Inprasitha, 2015a). The Open Approach differ from the ordinary methods that is the teachers have to act as the observers and record the leaners' concepts (Inprasitha, 2015a) and the teachers whom applied an Open Approach need to realize in learners' mathematical concepts as much as possible (Inprasitha, 2015a). However, teachers should to plan with their co-workers in order to expect or predict the further concepts of the learners. Inprasitha (2003), integrating Open Approach and Lesson Study which focus on the difference between people, especially the differences in thinking.

This research aims to explore the mathematical creativity of eleventh grade students. The target groups are: the first target group consisted of 50 eleventh grade students from Sarakhampittayakhom School with the first student teacher as the teaching performer. The second target group consisted of 38 eleventh grade students from Boon Wattana School with the second student teacher as the teaching performer. The instrument of research consisted; lesson plan which applied from integrating Open Approach and Lesson Study with these following details; 1) Lesson study team collaboratively plan the lesson by adapt open-ended problems from The open-ended approach a new proposal for teaching mathematics . 2) The first student teacher who is one of lesson study team teach the lesson in classroom of the first target group following 4 steps of open approach. 3) Lesson study team reflect on learning activities for collaboratively develop the lesson. 4) The second student teacher who is one of lesson study team applied the lesson plan from the first classroom to set up the reaching method for the second target group. After lesson study team collaboratively develop the lesson, the second student teacher teach the lesson in classroom of the second target group following 4 steps of open approach. and 5) Lesson study team collaboratively reflected on learning activities

from the second target group to use the revised plans to teach the lesson in a different classroom.

This research data analysis is both target groups concepts analysis. Both classes showed their mathematical creativity as the following details; the first classroom found that 2 mathematical creativity parts ; frequency 71%, flexible 28%. After that, the Lesson Study teams team reflected and improved the lesson plan and the second student teacher taught that lesson plan in the second class found that entire all mathematical creativity parts; frequency 75%, flexible 15%, originality 4% and elegance 6%.