



Classroom assessment in the eyes of Chinese primary mathematics teachers: A review of teacher-written papers



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ABSTRACT

In this paper we report on a review of papers written by teachers aimed at knowing more about teachers' perceptions of the current situation of classroom assessment in primary mathematics education in China. The review is based on 266 papers included in the China National Knowledge Infrastructure database. We found that the teacher-authors reflected various aspects of their classroom assessment practice, including the purpose of assessment, the content of it, the person who is the assessor, the assessment methods that are used, and the feedback that is provided. Most attention was paid to feedback; it seems many teacher-authors considered classroom assessment to be equivalent to feedback. In general, the conceived classroom assessment practice as described in the papers echoed well nearly all aspects that are advocated in the Chinese mathematics curriculum standards. The only aspect that was scarcely discussed in the papers was the use of assessment results to adapt and improve instruction.

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1. Introduction

Classroom assessment, considered as assessment in the hands of teachers for the purpose of informing teaching and learning, has been recognized and promoted in mathematics education all over the world. This important role of classroom assessment is also reflected in the mathematics curriculum reform and the accompanying assessment reform in China, launched in 2001. After more than a decade of reform, however, it is still unclear how mathematics teachers perform assessment in their classrooms. Gaining more knowledge about this can be achieved in different ways; our approach in this study was conducting a review of papers in teacher journals written by Chinese teachers addressing classroom assessment in primary school mathematics education. By analyzing these teacher-written papers, we aimed at casting light on the activities teachers use in the assessment of their students, and whether the reported practice is related to the assessment guidelines in Chinese curriculum documents.

In the remainder of this introduction, we will elaborate successively on the role of classroom assessment in mathematics education in general, the content of the mathematics curriculum

reform in China, the accompanying assessment guidelines, and finally we will formulate our research questions.

1.1. Classroom assessment in mathematics education

In the last decades, many countries have reformed their mathematics education towards a curriculum which no longer solely focuses on knowing facts and carrying out routine skills, but also on understanding and higher-order skills such as reasoning, modelling, and problem solving (see, e.g., [NCTM, 1989, 2000](#)). This reform in mathematics education has also changed the view on assessing students' learning and called for a new approach to assessment corresponding to and serving these changes in curricula ([Leung, 2008](#); [Romberg, Zarinnia, & Collis, 1990](#)). A new approach to assessment is required to make it epistemologically consistent with the didactics of mathematics ([Van den Heuvel-Panhuizen & Becker, 2003](#)). Assessment should correspond to the curriculum that is taught and the learning theory that is adhered to ([Shepard, 2000](#)). This means that in addition to students' knowledge and skills also their ability to solve more complex problems should be assessed, that not only the correctness of students' solutions should be the focus of assessment but also the strategies employed by students, and, finally, that assessment is seen as an on-going process integrated within instruction (e.g., [Berry, 2011](#); [Romberg et al., 1990](#); [Shepard, 2000](#); [Suurtamm, Koch, & Arden, 2010](#); [Van den Heuvel-](#)

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Panhuizen, 1996). An important characteristic of this new approach to assessment is the awareness that assessment should not only be assessment *of* learning but also *for* learning, that is formative assessment, meaning that assessment should inform teachers' instructional decision making and students' learning (Assessment Reform Group, 1999; Black & Wiliam, 1998a, 1998b; Stiggins, 2002). Formative assessment 'in the hands of teachers' (Van den Heuvel-Panhuizen & Becker, 2003, p. 698) that is interwoven with instruction and fully integrated in the teachers' daily teaching practice is often called 'classroom assessment' (e.g., Black & Wiliam, 1998b; Brookhart, 2004; De Lange, 1999; Shepard, 2000; Stiggins & Chappuis, 2005; Wiliam, 2007). In general, 'classroom assessment' includes all kinds of formative assessment in which the teacher has the lead. This means that the teacher makes decisions about when, for what purpose, and by which method information about students' learning is gathered with the aim of informing further steps in his/her teaching. To gather this information, teachers can use a variety of methods: ranging from observing students' problem solving, listening to students' answers to questions and quizzes, to examining students' written work and administering tests (Keeley & Tobey, 2011; Wiliam, 2011a). Also, as part of classroom assessment, teachers can offer students opportunities for carrying out self- and peer-assessment (e.g., Wiliam, 2011b), in which teachers need to carefully set up and manage the activity while students play the leading role in collecting and using assessment information for their own learning improvement (Andrade, 2010; Topping, 2010).

In accordance with the worldwide reform of mathematics education towards using assessment to enhance teaching and learning, in the last decades, the relevance of classroom assessment is increasingly acknowledged in many countries (Berry, 2011). In addition, the interest in classroom assessment was particularly triggered by the review done by Black and Wiliam (1998b) in which they revealed that teachers' use of classroom assessment can lead to the improvement of students' mathematics achievement. Although this review and its conclusions were criticized, particularly on the reported effect sizes (e.g., Bennett, 2011), enough evidence remains that teachers' use of classroom assessment is linked to an increase in students' learning (e.g., Briggs, Ruiz-Primo, Furtak, Shepard, & Yin, 2012; Kingston & Nash, 2011; McMillan, Venable, & Varier, 2013; Veldhuis & Van den Heuvel-Panhuizen, 2014). Therefore, policymakers have embraced the use of assessment for learning. For example, the US National Council of Teachers of Mathematics (NCTM, 2013) has strongly endorsed the integration of such assessment in daily instruction. In Hong Kong, the Curriculum Development Council (CDC, 2002) recommended that all schools should review their current assessment practices and put more emphasis on assessment for learning.

1.2. Mathematics curriculum reform in China

In mainland China, in 2001, the Ministry of Education of the People's Republic of China (MoE) initiated a curriculum reform with the purpose of better preparing students to meet the challenges of the 21st century by publishing a curriculum reform outline (MoE, 2001a). To help teachers, textbook designers, and other stakeholders in the nine-year compulsory education develop a clear view on the implementation of the curriculum reform in mathematics education, the MoE (2001b) also published in that same year the mathematics curriculum standards. In this document, one can find detailed information about (1) fundamental ideas about mathematics and mathematics education, and the structure of the mathematics curriculum standards, (2) the objectives of mathematics education in terms of knowledge and skills, mathematical thinking, problem solving, and mathematical

and learning attitude, (3) mathematical content, and (4) suggestions with examples for instruction, assessment, and the design of mathematics textbooks and other materials.

The document of the mathematics curriculum standards (MoE, 2001b) was initially only used in parts of the country. By Fall 2006 it became compulsory nationwide (Ni, Li, Li, & Zou, 2011). One year later, this was followed by the release of a revised version of the mathematics curriculum standards (MoE, 2007). This revised version was developed by a group of fourteen scholars, researchers, teacher educators, and expert teachers in mathematics education, organized and authorized by the MoE. The mathematics curriculum standards issued by MoE in 2001 were modified based on investigations into its use and the suggestions and critical remarks from mathematicians, experienced mathematics educators, and in-service mathematics teachers from more than ten provinces in China (Shi, Ma, & Liu, 2012). The latest version of the mathematics curriculum standards was published in December 2011 (MoE, 2011). In this version, it is emphasized that students should develop the ability of identifying and posing problems together with the ability of analyzing and solving problems. Moreover, it is stressed that attention should be paid to calculation, modelling, geometric visualization, and creativity, together with number sense, symbol sense, space concept, data analysis, reasoning, and application.

1.3. Assessment as described in the mathematics curriculum standards in China

China has a long history of examination-oriented education (Berry, 2011), which has been changed remarkably when in 2001, together with the curriculum reform, a new approach to assessment was promoted. In the curriculum reform outline (MoE, 2001a) it is mentioned that the assessment reform can be characterized by reducing the overemphasis on using assessment for differentiation and selection purposes, and using assessment to facilitate students' development, teachers' enhancement, and the improvement of the teaching and learning practice. The latest version of the mathematics curriculum standards (MoE, 2011) released some ten years later contains specific information about how assessment is conceptualized within the Chinese curriculum reform movement. To better support teachers' assessment practice, the mathematics curriculum standards document gives guidelines for the following aspects of assessment: (1) main purposes of assessment, (2) the content of assessment, (3) who can be an assessor, (4) the methods that can be used for assessment, and (5) suitable ways of reporting and using assessment results.

1.3.1. Purpose of assessment

In contrast to the use of assessment for differentiating and selecting students – which was common practice before the reform – the new approach to assessment is aimed at contributing to the teaching-learning process. In line with this, three purposes are mentioned in the mathematics curriculum standards: assessment should be used to get a comprehensive understanding of students' learning, to help students to enhance their learning, and to facilitate teachers to improve their instruction. However, the description of the purposes is very brief, and no further explanations or examples are given.

1.3.2. Content of assessment

For the content of assessment it is stipulated that it should address what mathematics students have to learn and what mathematical competences they have to develop. Table 1 shows the assessment guidelines and the two examples given for the competence domains in the mathematics curriculum standards of the nine-year compulsory education.

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