

# Introduction of the JME Special Issue: Research on Classroom Practice at Primary Level

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In July 2021, the ICME 14 took place in Shanghai, China, as a hybrid event; a thematic focus of this international conference was the TSG 36 Research on Classroom Practice at Primary Level under the leadership of Shuhua An. The aim of this TSG is to share and discuss, at an international level, a wide variety of experiences of teaching and learning mathematics in the classroom (An et al., 2022). According to this aim the TSG 36 explored state-of-the-art strategies and approaches to address the concerns and problems, and advance the research on classroom practice with an ultimate goal of supporting it.

The international exchange of practice in the classroom allows the own activities to be recognized as a cultural phenomenon. It can provide impetus to recognize one's own national practice in its cultural character and to pick up impulses from other cultural practices in order to stimulate changes and innovations. The awareness of one's own cultural location is important on many levels, for example on the level of practice in the perception of new learning arrangements for the classroom, the level of research on teaching practice and the level of training and further education of (future) teachers whose suggestions can be applied in practice.

From the intensive discussion of a total of 22 contributions from 17 different countries in TSG 36 at ICME 14, the need arose to make this exchange visible and accessible to a wider audience through a thematically bundled publication beyond the proceedings. The result of this concern is this Special Issue of the Journal of Mathematics Education [JME], in which contributions are given the opportunity to present them in more detail again. Due to the breadth of the selected contributions (see Table 1), on the one hand the discussion at the conference is accessible to a broad readership, but on the other hand the examination of the topics presented here is deepened. As shown in Table 1 total of five contributions have been brought together in this Special Issue, which represent both a certain international breadth and very different aspects of the practice of mathematics teaching at the primary level.

**Table 1**

*Authors, Countries, Paper Titles of the Special Issue Contributions in Alphabetical Order*

Authors	Country	Title
Bianco, Giuseppe & Di Paola, Benedetto	Italy	Calculus artefacts in Chinese textbooks: variational approaches with prospective primary teachers (in Italy)
Fenech, Antoine & Cabassut, Richard	France	Go game as classroom practice to learn mathematics at French primary level
Gobede, Fraser	Malawi	Affordances of Systematic Shifting of Mediational Means When Introducing Whole-Number Addition: The Case of a Grade 2 Teacher in Malawi
Liu, Jinqing; Francis, Dionne Cross & Eker, Ayfer	USA & Turkey	Examining US Elementary Teachers' Perceptions of and Comfort With Students' Mathematical Mistakes
Meei, Jong Cherng	Malaysia	Data Use to Inform Mathematics Instruction: An Exploratory Study (from Malaysia)

With the use of "cultural transposition" (Bianco & Di Paola, in this issue; Mellone et al., 2019), the contribution by Giuseppe Bianco and Benedetto Di Paola directly grasps the importance of cultural exchange for the further development and change of one's own teaching practice and learning in the classroom. In a seminar, prospective primary teachers are familiarized with didactic concepts for early mathematics lessons from China in order to perceive their own cultural lens during the training and to expand their ideas about possibilities in mathematics lessons (Bartolini Bussi et al., 2014; Mellone et al., 2019). According to this theoretical background, the article of Bianco and Di Paola in this special issue focuses on the Chinese concept of "variation", as one of the stimuli proposed in a PD' path with Italian pre-service teachers. This didactic approach is demonstrated using different counting artefacts coming from different cultural tradition as the Abacus, the Straws and the Chinese abacus, the Suanpan (算盘), in the first and second school years. For this purpose, a corresponding textbook analysis is carried out, which gives a good insight into the approach through several illustrations from original Chinese textbooks and can thus also encourage the readers to think about alternative approaches to the decimal system, which are opened up with the abacus.

The contribution by Antoine Fenech and Richard Cabassut presents a possible uses of the game of Go in mathematics lessons at primary level. The paper, which is based on the French curriculum for possible uses, also takes up ideas from another culture with this complex strategy game of Go from East Asia, which is already being discussed in terms of possible uses in primary school (e.g., Tachibana et al., 2012). The didactic development project is a cooperation between various institutions that bring in different expertise (Strasbourg Go Club, primary school teachers and a university didactician) and follows the approach of praxeology theory (Bosch et al., 2006). In the paper Fenech and Cabassut state that the project aims to develop appropriate further

training offers for mathematics teachers at primary level. Therefore, the development of the tasks is not only about stimulating strategic thinking and general problem-solving skills through the introduction of the game of Go and its rules and strategies, but also about learning and deepening specific mathematical operations, such as counting skills and multiplication. The materials of the game of Go (board and stones) are seen as a new register of representations that enable a wide range of mathematical activities and can stimulate different types of mathematical reasoning processes (Cabassut, 2005). Mathematical reasoning (and proof) is not only part of the French curriculum (Ministère, 2016), but also one of the internationally recognized Process Standards (e.g., NCTM, 2000) from primary level onwards and thus the tasks presented for the game of Go in the article are compatible with many national curricula around the world.

In the third article, Fraser Gobede presents a case study of a teacher in Malawi dealing with artefacts and the shift of mediational means. The author makes direct reference to the importance of the cultural context for mathematics teaching and highlights the special cultural framework of the analysed lessons: It is a multi-lingual context (various African mother tongues and English as the target language at the end of the primary level) in a rural area in Malawi with a corresponding sizes and also very fluctuating numbers of children in the classroom. The set of sociocultural tools of mediation (Kozulin, 2003) serves as the theoretical background. The lessons for addition in the number range up to 20 are analysed with the help of the Mediating Primary Mathematics Framework (Venkat & Askew; 2018). The focus of the analysis is the use of different artifacts and the shift to symbolic representation. In the analysis, the special feature of the limited resource settings becomes clear at the same time, as does the importance of multilingualism. Gobede's article also reveals difficulties that arise when transferring successful didactic approaches, such as the approach of variation in comparative studies of successful Asian countries (Mhlolo, 2013) to other cultural circumstances e.g., such as the limited resources and multilingualism. In this sense, the article can help to develop ideas for a further training concept for teachers in limited resource environments - such as Malawi - in order to systematically change and improve the teaching practices in the classrooms through a theoretically based adaptation of successful didactic concepts of other cultural contexts.

The forth paper by Jinqing Liu, Dionne Cross Francis and Ayfer Eker, discusses the important to better understand and strengthen teacher-student relationships to improve student outcome metrics. Supported by research in neuroscience, Dweck (2008) and Boaler (e.g., 2015, 2016) stressed the power of making mistakes and experiencing productive struggle in math learning. Palkki and Hästö (2018) and Tulis (2013) pointed out a possible relation between the teacher behaviour about the "use" of students mistakes and his/her culture: Teachers in the United States tend to view students' mistakes differently from their counterparts in other countries. On the contrary,

according to Stigler and Perry (1988) teachers in Japan shared their students' incorrect solutions most frequently for whole classroom discussions. Following this framework, the paper of Liu, Francis and Eker examined seven elementary teachers' descriptions and enactment of mathematically productive relationships (MPRs) and their influence on classroom management practices. In their study teachers' descriptions of MPRs incorporated four themes: (a) creating safe, mistake-friendly environments, (b) developing trust and respect between the teacher and student, (c) establishing and maintaining clear and high expectations, and (d) ensuring classrooms remain safe spaces. Discussing the founded significant implications of MPRs and the influence of different classroom management practices on students' learning opportunities, the authors opportunely stress the idea that the core task ahead for math education researchers and teacher educators is not to convince teachers that mistakes should be valued; instead, to support them in developing the breadth and depth of knowledge and the efficacy needed to create mistake-friendly environment.

The fifth paper by Jong Cherng Meei investigates the state of data use to inform instruction among primary school mathematics teachers in Malaysia. According to Gummer & Mandinach (2015) it is essential that teachers are not only able to use data, but at the same time they perceive themselves as being capable of using data. Teachers need support from their school, district and/or state education offices and personnel to get the most out of the data (Hamilton et al., 2009). Examples of support should be to include efficient technology to access and examine data, approval and support from the leadership, professional developments regarding data use, and school staff or expert who can help teachers use data. Meei's paper looks at the type of data these teachers used to inform their mathematics instruction, their predominant level of data literacy, their training needs and support in data use, and their confidence in using data. Quantitative and qualitative results of the questionnaire - adapted from The Teacher Data Use Survey (Wayman et al., 2016) - and interviews indicated that the data, which was most frequently used, was classroom-based assessment data. The involved teachers were of the opinion that more professional development courses should be conducted for them so that they can use data effectively and systematically to inform their practice. In his paper, Meei clearly shows also that more information needs to be gathered to gain a more detailed insight into data use by teachers to inform mathematics instruction. Further researches on the same subject should include the specific types of support and training needs required by the teachers to make informed decisions on mathematics instructional practices. The actual teacher data use practices, how teachers' instruction is informed by the use of data, how teachers use data individually or work in groups to analyse and act on data, roles of leadership and leadership strategies for successful implementation of data use in schools could all be potential directions for future research.

Nowadays, around the world, the research and the school is going to live a crucial changing moment. Researchers, experts and teachers, more than

in the past, need a shared reflection about the new scenarios that we are living in education but not only. We are sure that the inputs offered by the authors of the different papers included in this volume will be a point of reference for the literature in Mathematics Education and, in particular, for future investigations on the same subject.

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