

Knowledge, teaching competences of mathematics teachers and becoming a teacher trainer

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The AIEM Special Issue entitled *Knowledge, teaching competences of mathematics teachers and becoming a teacher trainer* offers continuity with other recent special issues in international journals focused on topics regarding mathematics teachers, their practices, learning and professional development. In the *Journal of Mathematics Teacher Education*, for example, with the special issues *Video as a catalyst for mathematics teacher' professional growth*, 2017, 20(5) and *Mathematics teachers as partners in task design*, 2016, 19(2-3). In *ZDM*, there are *Impact of university teacher education programs on teacher change and mathematics teaching practice*, 2017, 49(2) and *Theoretical frameworks in research on and with mathematics teachers*, 2013, 45(4). This series of special issues indicates focuses and perspectives on mathematics teachers with the central interest of researchers and teacher trainers on questions on and about mathematics teachers, their practices and training processes.

Research into mathematics teachers is linked to the clear need in different areas for a better understanding of the role of the teacher in mathematics teaching and learning situations and in professional development. Approaches to these problems and the foci proposed by the researchers indicate a conceptual and methodological diversity that points to the complexity of the phenomena under study. The current special issue deals with international initiatives that reflect some of the conceptual approaches being developed in relation to knowledge, practice and learning of the teacher of mathematics.

The issue contains six articles, of which three are from Colombia/Italy, Singapore and the UK, and another three research groups in Spain (Barcelona/Granada/in collaboration with Chile, Alicante/Seville and Huelva). These articles present three important topics in research on and about teachers of mathematics: specialist knowledge for the teaching of mathematics, conceptualisation and development of teaching competences through use of knowledge and generation of theoretical perspectives for explaining and understanding the process of becoming a teacher trainer for mathematics teachers.

The articles by M. Á. Montes, L. C. Contreras and J. Carrillo (University of Huelva) and by B. H. Choy and J. Dindyal (NIE-Nanyang Technological University, Singapore) study the practice of the teacher of mathematics and the indication of the knowledge mobilised in teaching and learning situations, with special attention on the specialist knowledge of the teaching linked to the practice of teaching mathematics.

M. Á. Montes and colleagues underline the potential of the *Mathematics Teacher's Specialised Knowledge* (MTSK) model for explaining the characteristics of the teacher's knowledge as it is mobilised in teaching situations. The role that can be played by certain mathematical concepts (the concept of infinity in the article) as articulators of the specialised knowledge of the mathematics teacher is particularly highlighted. In their article, B. H. Choy and J. Dindyal underline the use made by the teacher of their knowledge for modifying examples and problems in the teaching process and thereby maximising learning opportunities for their students (*bianshi*) as

an aspect of their mathematics teaching practice. The teacher's competence in recognising and making use of variations in the standard problems that arise as a demonstration of the use of specialised knowledge in teaching is highlighted. These two articles emphasise two features of the specialised knowledge of the mathematics teacher: the organisational role for the teacher's knowledge of concepts ("big ideas") and the knowledge that allows for variation on standard problems (*bianshi*).

The articles by C. Fernández, G. Sánchez-Matamoros, J. Valls and M. L. Callejo (Universities of Alicante and Seville); J. D. Godino, B. Giacomone (University of Granada), V. Font (University of Barcelona) and L. Pino-Fan (University of Los Lagos, Chile); and Á. Bohórquez (Distrital University, Colombia) and B. D'Amore (University of Bologna, Italy) address knowledge acquisition and development of competences of the mathematics teacher in the context of the initial stage of training. These three articles highlight the characteristics of the use of the teacher's knowledge taking into account the role played by theoretical tools (knowledge and schemes of analysis) in the development of teaching competences by mathematics teachers.

The article by C. Fernández and colleagues have summarised the results of research carried out in recent years by his group on the conceptualisation of the ability for "professional noticing" in situations of teaching and learning of mathematics. In this article the authors underline the role of indicators for the development of "professional noticing" skills in the definition of learning contexts. The article by J. D. Godino and colleagues deals with the importance of the teacher's analysis of the teaching-learning situations as a teaching competence. The article presents the tools derived from the *Mathematical-Teaching Knowledge and Competences* model as a scheme for analysis that trainee teachers can use when they are learnt to describe and assess learning situations in mathematics. In the third article, A. Bohórquez and B. D'Amore focus on trainee teachers and the conditions that may explain changes in conceptions of management of the teaching and learning process. Aspects such as group work, mathematics activity in the classroom and objectivation theory are considered.

These three articles underline the need for initial teacher training programmes to offer trainee teachers contexts that allow them to look more closely into the nature of class interactions, and theoretical tools (schemes of analysis and specific knowledge) which will enable them to give meaning to teaching and learning processes in mathematics in order to assess and act on them. The results of the research highlight the *professional learner profile of the teacher* (learning to use specialised knowledge to give meaning to teaching and learning situations in which teachers need to act).

L. Brown, T. Helliwell and A. Coles from the University of Bristol (UK) are the authors of the final article of the special issue. It deals with the transition of mathematics teachers when they become teacher trainers. The authors adopt a vital historical perspective to describe the transitions, which are explained from an enactive approach and the characteristics of meta-communication. The theoretical approach to understanding the process of becoming a teacher trainer in mathematics underlines the interaction between the individual and the environment.

The three areas covered in this special issue (teacher knowledge, teaching competences and becoming a teacher trainer in mathematics) offer theoretical references and ways of explaining aspects of the practice of mathematics teaching, and knowledge acquisition by the mathematics teacher and by the teacher trainer. Seen together, these articles show how the different lines of research lead to

knowledge that allows us to increase our understanding of mathematics teacher training as an area of scientific research, opening up new paths to promote the relationship between theory and practice, and between research and teacher training.