Teachers' and students' perspectives in mathematics teaching and teacher education

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Research in mathematics teaching and mathematics teacher education has the student and the teacher as the main focus of attention. We study in what ways teachers consider students' perspectives when planning and enacting lessons, and we look for ways of supporting them in this direction. We also attempt to bring our practice as mathematics teacher educators close to teacher's reality looking for bridges between research/theory and the practice of teaching. The articles published in this issue add to our understanding of these complex relations.

The study of Roth McDuffie et al. provides us insights about how curriculum materials and the Common Core State Standards for Mathematics (CCSSM) in the USA are perceived and used by middle school mathematics teachers. The setting of the study is two school districts where different curriculum programs are used, but the goal of the educational authorities of the teachers is to follow the CCSSM. The authors use the broad definition of teacher noticing that includes attending, interpreting and responding and the dialogic and direct instructional practices to investigate what the teachers notice while planning, enacting and reflecting on the lesson. By using a combination of grounded theory approaches and of their analytic framework of noticing and instruction, they found that teachers' instructional orientations and curricular noticing practices indicate three different instructional patterns. The first pattern is characterized by dialogic orientations for official and enacted curriculum; the second shares similarity with the first in the phase of planning and reflecting, while there are inconsistencies in the enactment phase. In the third pattern, direct instruction is consistently adopted in planning, enacting and reflecting on the lesson. The study shows the complex relation between the resources that the teachers have available their perceptions and instructional practices. Contextual issues of the teachers' work can add to this complexity that makes difficult to the curriculum development to meet the teachers' need and at the same time create opportunities for students to engage in rich mathematical activity.

Ostermann, Leuders and Nückles report on an interventional study aiming to improve prospective teachers' ability to estimate the difficulty of tasks taking into account students' perspectives. The study took place in the context of a course on functions as a part of a teacher education program in Germany, and all the parts of the study were carried out through an online survey. Nickerson's framework emphasizing the relation between

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a person's perspectives with others' perspectives and the framework of Ball and her colleagues on teacher knowledge were combined to form the research hypotheses and the analytical framework of the study. Aiming to develop prospective teachers' diagnostic judgment and in particular their ability to estimate the difficulty of tasks, a 90-min intervention was designed where prospective teachers learned about students' misconceptions of the function concept and estimated the level of difficulty of tasks on functions. A quantitative research design was used through the use of pre- and posttests with three groups of prospective mathematics teachers: one group participated in the intervention, the second was only sensitized in the problem of estimating task difficulty, and the third acted as a control group. The authors found that prospective teachers' diagnostic judgments can improve when their pedagogical content knowledge and especially their knowledge about students will be developed. In this study the issue of taking into account students' perspectives and needs in mathematics teacher education is viewed through the development of prospective teachers' competences in task design and assessment.

The study of Simpson, Vondrova and Zalska focuses on the shifts of patterns of attention of prospective secondary school teachers while observing videos from classroom teaching and on the sources that influence these shifts. The context of the study was a masters' course in Czech Republic leading to a teaching certificate, while PST observed videos from TIMMSS video study and wrote reports on what they noticed. The authors undertook two studies by controlling some variables like PSTs' teaching experience and the type of videos-based intervention. The authors used the framework of van Es and Sherin for coding prospective secondary teachers' reports in both studies by using the four dimensions of the framework: actor (student, teacher, curriculum developer, self, other), topic (classroom management, climate, mathematical thinking, pedagogy), stance (describe, evaluate, interpret) and specificity (specific, general). In the first study they formed subgroups of the participants according to their teaching experience to examine the effect of the teaching experience on the identified patterns of attention. The second study was intervention based on the observation of videos by the prospective teachers and the discussion among the prospective teachers on their written observations. An observation of a video took place before and after the course and pre- and post-intervention reports were analyzed by quantitative approaches. The results indicate that prospective teachers' teaching experience was not related to what they noticed while the guided observation of videos in the context of the course resulted in shifts to prospective teachers' attention toward students' mathematical thinking but not to a more interpretative stance. Their conclusions that teaching experience does not necessarily lead to deeper levels of professional noticing and that to develop an interpretive stance is too difficult for the prospective teachers pose new challenges to mathematics teacher educators. Developing structures on mathematics teacher education that can relate field experience and the classroom reality with research informed and theoretical constructs coming from mathematics education research could be possibly one way to develop prospective teachers' theorizing of their observations.

The study of Psycharis and Kalogeria investigates the process of becoming a mathematics teacher educator in technology-enhanced mathematics. The context of the study was a large-scale professional development program in Greece aiming to prepare teacher educators to support teachers in integrating digital technologies in mathematics teaching. Practicum constituted an important part of the program and included observation of teacher education sessions and designing and implementing of teacher education sessions. By using the documentary approach of Guedet and Trough and the double instrumental genesis Abboud-Blanchard and Lagrange, the authors analyzed teacher educators' didactical designs in working with teachers as a part of their practicum. Through the analysis

of three typical cases of teacher educators, the authors indicate their professional growth stemming from the activities taken place in the context of the professional development program. Three different roles were identified: the teacher educator as an instructor (focusing on teachers' technological and technological content knowledge), explainer and facilitator (both facilitating technological pedagogical and pedagogical content knowledge but providing different degrees of teacher autonomy). These roles relate to how the teacher educators view teachers (as students or as teachers of students), their epistemology for the teaching and learning of mathematics with technology (ranging from the emphasis of the "correct" use of digital tools to the intertwining of the mathematical content and its pedagogy), and their interaction with teachers and other teacher educators in the context of the professional development program. In this article, the role of field experiences is under discussion as in the study of Simpson et al. but with a rather positive impact. The process of "observation–reflection–design–implementation–reflection" emphasized in the professional development program provided a structure where mathematics teacher educators could notice teachers' needs and transform their didactical designs to meet these needs.

Reflecting on the four articles of this issue, we see that teachers' and students' perspectives are to some extent expected to be taken into consideration by the researchers. Both practicing and prospective teachers are expected to consider students' perspectives. The articles of Osterman et al. and Simpson et al. make this central at the case of prospective teachers. The study of Roth McDuffie et al. links curriculum resources to teacher orientations, while the study of Psycharis and Kalogeria focuses on how teacher educators consider teacher knowledge in their didactical designs.

In her editorial, Jaworski (2005) addressed the close links among mathematics teacher education, mathematics teaching and students learning that studies in JMTE have reported:

It allows the linking of theory in the learning of mathematics to the learning of teachers of mathematics, and considerations of how teachers learn related to the learning of their pupils. Increasingly it allows us to address the learning of teacher educators and its relation to the learning of teachers. (p. 1)

Our attempts to address these links in our practice as researchers and mathematics teacher educators pose theoretical and methodological challenges as the studies of this issue indicate.

Reference

- Jaworski, B. (2005). New beginnings and recurring themes. *Journal of Mathematics Teacher Education*, 8, 1–3.