Mathematics teacher professional learning and teacher education practices

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Many papers published in JMTE focus on the impact of mathematics teacher education experiences on teacher professional learning. For example, in the previous volume (Volume 23) about half of the papers reported teacher education practices for prospective and practicing mathematics teachers as well as for beginning mathematics teacher educators. These included: the analysis of videotaped lessons by practicing teachers; the design of workshops aiming to develop teachers' awareness of affective issues related to students' engagement; collaborative settings as joint work of triads of prospective teachers, mentor and university supervisor or lesson study with practicing teachers; the use of digital resources (platforms) to support teachers' noticing skills; bibliotherapy as a way of providing prospective teachers' narratives of teachers; courses integrating the history of mathematics for mathematics teacher education; mathematics education courses for prospective teachers. The impact of this range of teacher education practices was examined by focusing on the quality of the teachers' reflections, on the development of the teachers' identity, on the teacher mathematical knowledge for teaching, and on teacher noticing or on teachers' pedagogical beliefs. This impact was investigated through questionnaires, interviews or classroom observations adopting qualitative or quantitative data analysis processes. The papers of this issue extend the teacher education practices and settings and introduce theoretical and methodological frameworks that allow a rather dynamic interrelationship between teacher education practices and teacher professional learning. I discuss below the four papers and summarize emerging issues.

The paper of Goodchild, Apkarian, Rasmussen and Katz reports a study focusing on mathematics teaching and learning in the context of an inquiry-based introductory course on differential equations for prospective secondary mathematics teachers. The authors use the community of practice theory and the constructs of critical stance and critical alignment to study prospective teachers' participation in the course on differential equations. In particular, they focus on the development of prospective teachers' critical stances toward mathematics, its learning and its teaching through the analysis of their end-of-semester portfolios and from their oral presentations of items from the portfolios. Their analysis uses the constructs of joint enterprise, mutual engagement and shared repertoire as well as the concept of critical alignment to study prospective teachers' critical stances of mathematics, mathematics learning and mathematics teaching. Critical stance was recognized through

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three components such as awareness that the course experience can be different, a sense of evaluating the quality of this experience and the sense of agency to make improvements. At the empirical level the study shows that the inquiry-based course offered opportunities for prospective teachers to reflect critically on their experiences. At the theoretical level, the authors introduce the construct of “critical” stance as complementary to “critical alignment.” Critical stance relates to the personal characteristics and attributes that a person brings to the participation in a practice while critical alignment to a practice relates to the relationship of a person with the practice. This complementary relation of the two constructs relates to the discussion about the different positions in which practices constitute the participants, practice-in-person and person-in-practice (Lerman, 2000).

While the study of Goodchild et al. examines the impact of a mathematics course on prospective mathematics teachers’ development of awareness, the study of Ulusoy and Çakıroğlu offers a structure for developing prospective teachers’ noticing skills. In their study, the focus is also on prospective teachers through an analytical framework developed from the theory about teacher noticing. The designed structure is based on the development of videos, what the authors call micro-case video designs, that address examples from students working on geometrical tasks related to trapezoids indicating certain aspects of students’ thinking reported in the research literature. These aspects were also not familiar to the prospective middle school mathematics teachers who participated in the study in the context of a teacher education program. The micro-case videos are analyzed individually and collectively by the prospective teachers in writing reflection papers before and after group discussion. In the initial reflection paper, the prospective teachers were asked to write about what they noticed about students’ understanding, their interpretations and their instructional strategies. In the group discussion, the analysis was based on the framework of van Es and her colleagues, which supported a focused and interpretative way of discussing and analyzing their observations. In the post-discussion reflection paper, the prospective teachers wrote about their experiences from the group discussions and proposed instructional actions. The results of the study show that the above teacher education structure and in particular the group discussions helped prospective teachers to develop their noticing skills and especially their proposed instructional activities in relation to students’ thinking of trapezoids. The study contributes to the discussions about situations of representations of practice that have been used to promote teachers’ attention to specific phenomena (e.g., Herbst & Kosko, 2014).

The study of Beilstein, Henricks, Jay, Perry, Bates, Moran and Cimpian examines practicing elementary school teachers’ perceptions of professional learning in an online community where they observe videos from classroom lessons and post their reflections to the platform. The authors use a situated perspective of learning to claim that researching how the teachers feel about their learning is a way to address learning. The main focus of the study is to explore whether the analysis of the website data about teachers’ comments is adequate for understanding teachers’ learning from a video in the context of online communities. The authors compare this website data with 41 teachers’ responses on an interview to study convergences and divergences and the factors that explain why many teachers do not post in the online teacher communities. Using a combination of quantitative and qualitative analysis and adopting grounded theory techniques, the authors identify categories of perceptions of learning from videos in the context of the online teacher communities and of the reasons that the teachers avoid posting comments about the videos. The findings of the study challenge existing research that on the basis of posted online commentary concludes that learning rarely exists online in asynchronous settings. In this study there is evidence that teachers felt that they learned from the videos of the website

and provided vivid examples from their video experiences even in cases where they did not comment on them in the online setting. Reasons such as teachers' limited time, the inefficiency of the web discussion to be considered by the teachers as a real context for discussing with other teachers teaching and learning issues and even the fact that this possibility was not clear to the teachers indicate the complexity of teacher communication in virtual learning communities.

The paper of Myers, Auslander, Smith and Smith also reports a study on the impact of a teacher education program on prospective elementary mathematics specialists (PEMS). The program aimed to develop specialized content knowledge, pedagogical shifts related to a standards-based learning environment and change toward more productive mathematical beliefs and leadership knowledge and skills. The program supported the study of children's thinking using materials (e.g., video clips, written teaching cases) from the Cognitive Guided Instruction project and the implementation of cognitively-based instructional practices as well as mentorship focusing on collaborative professional learning sharing characteristics of working in communities of practice with the support of a more knowledgeable other. The courses offered were content specific while key assignments were clinical-style interviews with children; selection, adaptations, development and analysis of cognitively demanding mathematical tasks; a research project (data design, collection and analysis) and research reports on elementary mathematics education. The focus of this paper is on PEMS' pedagogical practices while implementing a standards-based learning environment in the context of field experiences under the support of mentors. The authors use qualitative and quantitative analysis of data collected from individual interviews with PEMS after the completion of the program, documentation of enacted lesson plans, written reflections and two classroom observations. Through open coding and constant comparative methods of the interview data and the written reflections, the authors developed six themes describing what PEMS valued in the program and in the classroom instruction. The themes concerned: classroom discourse, PEMS' questions, the rigor that the program achieved its goal, the non-evaluative feedback they received, the comfort and collaboration they experienced and their feelings or preparedness upon the completion of the program. The classroom observations and the mathematical tasks reported in the PEMS' lesson plans were analyzed quantitatively. The findings show that the program supported PEMS to facilitate effective discourse during mathematics instruction and to purposefully question students about their mathematical thinking and reasoning. PEMS also valued the collaborative environment of the mentor sessions as well as the timely feedback they received. The quantitative data analysis also indicates that PEMS had a high enactment of a standards-based learning environment and used tasks with high levels of cognitive demand.

All papers in this issue address teacher professional learning in the context of teacher education and professional development. Learning is studied through the analysis of teachers' interviews when they report on their learning experiences (in the studies of Goodchild et al., Beilstein et al. and Myers et al.) or by analyzing teachers' actual teaching, written reflections or professional discussions (in the studies of Ulusoy and Çakıroğlu and Myers et al.). Teacher education practices that include analysis of videos addressing instances of classroom events or cases of students' work, inquiry-based courses, online teacher communities and mentorship appear to create learning opportunities for the teachers with different needs (prospective, practicing, mathematics specialists). Theoretical lenses and analytical frameworks in combination with grounded theory methods provide tools to go deeply in the process of mathematics teacher professional learning in relation to teacher education structures. In the papers of this issue, the use of different types of data, the combination of qualitative and quantitative ways of analysis and the adoption of socio-cultural perspectives

like the community of practice theory allow a non-cause-effect relationship between teacher education practices and mathematics teacher professional learning. Addressing this complex relationship is a direction of current and future research in mathematics teacher education.

Reference

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