

Identification and characterization of mathematics teachers' reflection on the teaching practice that takes place in different settings

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by

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Summary

This dissertation examines mathematics teachers' reflections on their teaching practices, that took place in three different settings: Professional Development (PD) meetings, weekly journals, and stimulated-recall interviews, based on a videotaped lesson.

Reflection is a special kind of thinking, where a professional looks back at situations, analyzes them and rethinks his or her goals and decisions, in order to gain new insights about future actions and practices. The scientific literature points to the importance of reflective thinking and its contribution to teachers' work. However, the reflective process involves some challenges. Definitions of reflection are abstract, and models of reflection are complicated and not always accessible to practitioners. Taking part in a

process of reflection demands deep analysis which includes facing emotions and criticism. Thus, it appears that this process requires careful guidance, as well as practice and support. The literature offers a variety of tools, methods, and environments for reflection-based professional development, designed for teachers in general and for mathematics teachers in particular. This study seeks to contribute to the accumulated knowledge on reflection and is focused on the identification and characterization of mathematics teachers' reflective processes. For this purpose, I have posed two main research questions, pertaining to two central goals:

- (1) Unpacking of the concept of reflection: What categories of reflection can be identified in teachers' talk, within different settings, about teaching? how do these categories relate to, correspond or add to the existing literature?
- (2) Characterization of reflective processes conducted by mathematics teachers: What opportunities for reflection do different settings provide to mathematics teachers? what are the settings' features and affordances that support reflective processes? and what other phenomena related to reflective processes can be identified?

The research was conducted by examining case studies of Israeli secondary mathematics teachers. Data was collected from three settings: (1) PD course meetings; (2) Weekly journals that the teachers wrote for five months, about significant teaching events they have encountered; (3) Stimulated-recall interviews, where the teachers individually watched a videotaped lesson from their own class and freely discussed situations therein. While these three settings differ in many features, they have all enabled teachers to express themselves about mathematics teaching in a reflective way.

Qualitative research methods were used for the data analysis. The first phase included the outlining of the reflection categories – actions or phases which are part of comprehensive reflective process. This was done through an iterative process of going back and forth between identifying categories from the data in an inductive approach ("bottom-up") and comparison to definitions and models offered by the literature ("top-down"). The goal of the second phase of the study was to point out the various opportunities for reflection offered by the different settings. First, the cases were examined: using the categories of reflection resulting from the first phase, the expressions of each teacher in the three settings were analyzed in order to identify patterns of reflective processes. Second, the patterns found helped to point out the opportunities for reflection each setting offers, as well as the settings' features and

affordances which support these opportunities or hinder them. Looking both across the cases and across settings – different phenomena were further recognized.

The analysis resulted in the identification of six categories of reflection: (1) observation of 'what was done' and analyzing it; (2) consideration of alternatives, doubts, or dilemmas; (3) re-orientation; (4) consideration of teachers' beliefs; (5) addressing the emotions a situation evokes; (6) addressing challenges of teaching.

Opportunities for reflection were identified in each of the settings: The PD meetings affords reflective discussions on mathematics teaching including "mathematical reflection" – a deep examination of mathematical concepts and ideas. In these meetings, teachers were exposed to different teaching practices and analyzed them in a guided discussion with peers: discussing alternative actions, as well as goals and beliefs that underlie them. The weekly journals offer the teachers a personal intimate space, where they can write sincerely about a specific and focused situation, while considering goals and beliefs. Writing journals is not an easy task for many teachers and requires time and availability. The stimulated-recall interview also provides a personal setting, where teachers can watch an authentic representation of their own teaching, examine situations, analyze, and evaluate them. The focused and careful watching enables teacher to notice situations, including some that were overlooked in "real time". Nonetheless, self-watching stirs emotions, and some teachers tend to criticize themselves or justify their actions, instead of analyzing them. The presence of another person can assist teachers but can also create feelings of discomfort, even in a safe and supportive environment.

Differences were identified in some of the teachers' expressions within different settings, as well as in the focus of the teachers' expressions and in the aspects they related to in their reflections. The findings demonstrate that some of the teachers may need significant guidance when attempting to reflect on their practice, while for other teachers the process is more "natural". Furthermore, the teachers differ in their readiness to reflect, as manifested in their willingness to share, think about and analyze their teaching experiences, and in the importance they attribute to their involvement in a reflective process.

This study has both theoretical contributions and practical implications. Theoretically, the study connects between empirical analysis and known definitions of reflection from within and outside the field of mathematics education and offers validation of various aspects included in reflective processes that are not always emphasized in

mathematics education. The study offers a framework for analyzing reflective expressions of teachers and an extended definition for reflection. Practically, the study indicates that involvement in a significant reflective process is not simple yet can be learned. It also highlights the unique contribution of each setting, and how it caters for teachers' different needs and personal characteristics. The study emphasizes the need to externally guide reflective processes, and to provide support which takes into account the complexity of reflection, in order to motivate participation in the process. These conclusions can contribute to further design and development of various settings and tools with which mathematics teachers can explore their teaching in a reflective way and learn from it.