This is the published version of a paper presented at *Tenth Congress of the European Society for Research in Mathematics Education (CERME10), February 1-5, 2017*.

Citation for the original published paper:


N.B. When citing this work, cite the original published paper.

Permanent link to this version:
http://urn.kb.se/resolve?urn=urn:nbn:se:lnu:diva-70264
Practice of planning in mathematics teaching – meaning and relations

Helena Grundén

Linnaeus University, Växjö, Sweden; annahelena.grunden@lnu.se

Understanding the complexity of teaching also means understanding issues outside classrooms, including planning in mathematics. Although planning is part of a mathematics teacher’s everyday life, there is no shared understanding of it, and little is known about how teachers’ planning is related to other practices. In response, to explore what planning means to mathematics teachers and planning’s relations to other practices, interviews were conducted with teachers and their contents analyzed in several steps to generate a story of each teacher’s experiences with planning. For one teacher, Fia, planning meant decisions and considerations about mathematical content and teaching situations, as well as navigating the decisions and opinions of other actors. Fia’s planning is related to practices of management, mathematics teaching, and mathematics teachers, all of which influenced her planning and how her students encountered mathematics in the classroom.

Keywords: Planning, teaching, meaning, practice, interview.

Introduction

Teaching in mathematics is complex and cannot be isolated from students’ learning or context. To acknowledge that complexity, “deeper explanations of teacher’s decisions and actions” (Potari, Figueiras, Mosvold, Sakonidis, & Skott, 2015, p. 2972) are necessary. The decisions that mathematics teachers make and the considerations they take into account before entering teaching situations influence what happens in the classroom and thereby students’ opportunities for learning. To explore those considerations and decisions, the planning in mathematics teaching is vital in order to understand the complexity of teaching and to improve students’ possibilities to learn. However, research has demonstrated a lack of consensus about the concept of planning in mathematics. Former studies focus mainly on the planning itself and not how planning in mathematics is a part of a complex whole and related to other practices. The lack of shared understanding, as well as of studies addressing the complexity of teaching and planning, are thus inevitable stumbling blocks when studying planning in mathematics. Still, knowledge about what teachers actually do when they plan and their constructed meaning about planning might be important information that contributes to an understanding of teachers’ work. However, examining only individual aspects of teachers’ work is not enough to overcome gaps in research. Teaching is complex not only because it consists of many parts, but also because those parts are framed by “contextual, epistemological, and social issues” (Potari et al., 2015, p. 2972). To elucidate those issues, it is helpful to conceive planning in mathematics as a practice in which individual teachers act in a specific time and place, and in which their habitual ways of acting are related to other practices within “a network of practices” (Chouliaraki & Fairclough, 1999, p. 23). By acknowledging planning in mathematics as a practice, the aim of this study was to explore that practice as a part of a network of practices. To that end, it was necessary to know how teachers construct meaning while planning and reflecting upon their planning in mathematics, to what practices they relate planning and reflection, and how they express them in stories about their planning. An interview study with six teachers was designed to answer those questions. This paper recounts the story of one teacher, Fia, that includes several of the aspects and relations described by the other teachers interviewed.
Background

Planning in mathematics teaching

Although planning done by mathematics teachers bears consequences for students’ learning, studies in the topic remain scarce. Research about planning in mathematics that does exist address three chief aspects: design research including learning and lesson studies, teachers’ mathematical knowledge in relation to their planning, and models and templates for planning. Few studies, none of them conducted in Sweden, have focused on what teachers do in their everyday lives as teachers. National documents based on the Swedish curriculum advocate that planning should be done in a systematic way (Skolverket, 2011) similar to that in models emphasized in research (e.g. Gomez, 2002; Superfine, 2008). However, conversations with Swedish teachers and student teachers have indicated that planning means deciding what to do with a focus on activities, not goals or mathematical content. Such a focus on activities also appears in international research on the topic (Akyuz, Dixon, & Stephan, 2013; National Research Council, 2001). In sum, when people talk about planning in mathematics teaching, they demonstrate no shared understanding of what it means.

Practice

One way of describing the complexity of teaching is to use the term practice, which captures both individual people’s actions and more habitual, common ways of acting within a practice (Chouliaraki et al., 1999). Accordingly, conceiving planning in mathematics as a practice can afford a way to conceive teachers’ actions both as individual actions and actions shared by other mathematics teachers, as well as a way to conceive the relationship between those actions and abstract structures, that is how social structures govern people’s possibilities to act (Lund & Sundberg, 2004). Since each practice is determined from others within a network of practices and since power relations always are present (Chouliaraki et al., 1999), knowing more about teachers’ planning practice becomes a way of knowing more about how the process of planning is related to other practices and how power relations are working within the network of practices. In that sense, using practice as a concept to explore planning in mathematics is a way of considering “contextual, epistemological, and social issues that frame mathematics teaching” (Potari et al., 2015, p. 2972).

Meaning

In this study, meaning referred to “a (collectivity of) subjects’ way of relating to – making sense of, interpreting, valuing, thinking, and feeling about – a specific issue” (Alvesson & Karreman, 2000, p. 1147). How teachers relate to planning, makes sense of planning, interprets planning, values planning, and thinks and feels about planning were thus of interest in interviews and their analysis. The meaning that teachers expressed was both transient – that is, constructed and emergent in interactions in interview situations – and durable – that is, connected to cultural and individual ideas. By conceiving meaning as partly durable, it was possible to explain how previous experiences and more habitual ways of acting formed part of the meaning that teachers expressed in interviews.

The study

An important starting point when designing the study was an interest in considerations that teachers’ have and the decisions that they make that precede and influence what happens in the mathematics classroom, here called planning in mathematics teaching. With the notion that planning is both a
focused, time-bound activity and what emerges from reflections and thoughts that can occur at any
time, as well as given the aim to explore a concept about which there is no shared understanding, it
was necessary to approach the phenomenon as unprejudiced as possible. Since all teachers have heard
about and applied the concept of planning it was important to listen to the voices of teachers, hence
the decision to use interviews as a method. In the larger study, from which Fia’s story was taken,
teachers’ reflections on planning were explored. Each of six participants was asked to keep a
notebook for a period of two weeks before the interview in which they were asked to record actions,
reflections, and thoughts that for them were related to planning in mathematics. In the interviews,
teachers referred to their notebooks and chose topics to talk about. The interviewer’s role was to listen
affirmatively by uttering encouragement and nodding, asking for clarification when something was
unclear, and asking follow-up questions. By not using predetermined questions, teachers were
afforded freedom in the discussion about planning, which made it possible to see beyond pre-
understandings and the normative speech of planning that dominates mathematics education research.
The use of notebooks provided a possibility for each teacher to return to the notebook on several
occasions, and the interview situation where the notebook was used as stimuli, was a way to
experience meaning as durable. In the interview situation, transient meaning was constructed and
emerged in interactions both with the interviewer and with the notebook.

**Analysis**

Conducting interviews with notebooks as stimuli was a way of foregrounding teachers’ experiences
and meaning. To continue in that spirit, analysis needed to be based on the material, not predetermined
categories. Along with reviewing the stories of each teacher separately, aspects hidden in stories as a
whole were also sought. Those somewhat contradictory motivations required staying close to the
material and keeping a distance from it. Consequently, analysis proceeded in several steps, the first
of which involved reading each utterance per se, and noting what discursive action was performed by
making the utterance. During that initial coding memos were written to record spontaneous reflections
and ideas, as inspired by Charmaz (2014). In another version of the transcripts, meaning units (that
is, units considered relevant to considerations and decisions that preceded and influenced what
happens in the mathematics classroom) were marked. Each unit was paired with the activity belonging
to the unit in the first transcript, and by interpreting the meaning unit and the activity together an
aspect of planning, considering, or decision-making emerged (Table 1).
We have a template that we should stick to.

Expresses requirements from school administration

Formal requirements

Table 1: Examples from analysis step 1

To see aspects hidden in the stories as a group, distance from the material was necessary. Inspired by Szklarski (2015), meaning units were therefore transformed from the first- to the third-person perspective (Table 2).

<table>
<thead>
<tr>
<th>Meaning unit (from step 2)</th>
<th>Activity (from step 1)</th>
<th>Aspect</th>
</tr>
</thead>
<tbody>
<tr>
<td>We have a template that we should stick to.</td>
<td>Expresses requirements from school administration</td>
<td>Formal requirements</td>
</tr>
<tr>
<td>…that talented students and parents would say that it [special educational approach] was wrong… or the parents of those students</td>
<td>Expresses unspoken expectations from parents and students</td>
<td>Discourse of mathematics education</td>
</tr>
<tr>
<td>Why have I not talked about… talked with colleagues about this movie before?</td>
<td>Reflects on telling each other</td>
<td>Colleagues</td>
</tr>
</tbody>
</table>

Table 2: Examples from analysis step 3

The transformed meaning units were organized so that units dealing with the same aspect were grouped and read as a whole. As a result, meaning was identified and could be expressed as a product of synthesis (Table 3).

<table>
<thead>
<tr>
<th>Meaning unit</th>
<th>Transformed meaning unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>When will I be able to plan with my colleagues? The work turns into working alone although I don’t want it to. It is a lot… We make these big, long-term plans, but we never have time to see each other once we’ve started [implementing the plans].</td>
<td>When will she be able to plan with her colleagues? The work turns into working alone although she doesn’t want it to. It is a lot… They make these big, long-term plans, but they never have time to see each other once they’ve started.</td>
</tr>
<tr>
<td>Do I dare consider it [special education approach] from the beginning? Do I have the energy? Do I have the time?</td>
<td>Does she dare consider it from the beginning? Does she have the energy? Does she have the time?</td>
</tr>
</tbody>
</table>
Sorted and transformed meaning units
(per aspect)

<table>
<thead>
<tr>
<th>Content</th>
<th>Synthesis of transformed meaning units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Area [mathematical]</td>
<td>In her planning Fia sees that there are several parts to decide upon: what mathematical area the planning should cover, how to connect that to the everyday lives of students, and how to work with and make assessment in relation to students. Good activities can be reused with different foci. Fia thinks about how she will be able to apply an overall special education approach to her long-term plans.</td>
</tr>
<tr>
<td>Planning in detail and thinking… how</td>
<td></td>
</tr>
<tr>
<td>Relation to everyday life: How to get it [mathematics] related to the students.</td>
<td></td>
</tr>
<tr>
<td>At examination, it [thoughts about students] comes</td>
<td></td>
</tr>
<tr>
<td>How does Fia apply a special educational approach in her long-term plans?</td>
<td></td>
</tr>
<tr>
<td>They watched a movie again. Fia has done that several times… The story of 1[name of the movie], but that one focuses on different things. Finding… find activities that you can say, that you can get the most out of… and maybe dare to weed out those that really do not give anything.</td>
<td></td>
</tr>
</tbody>
</table>

Table 3: Examples from analysis step 4

The synthesis of the transformed meaning units were organized and assembled into stories, one of each teacher. This paper presents the story of Fia, since it emphasizes several aspects visible in the other stories.

**Fia’s story**

Fia is a mathematics-, science-, and technology teacher in compulsory school grades 7–9. She used the notebook for reflections on her planning, teaching, and decisions. In the interview, she referred to her notebook and chose topics to discuss. At several times, she also reflected upon her reflections and reached new insights – for example, when she referred to “pedagogical plans” in her notebook and discussed how constrained she feels when she has to do her planning with a template.

Fia: I have had exactly that [referring to the template] content before, but it has not been so formal… That formality… everything has to look the same. It makes me constrained, or I don’t feel free to think, or… 1,2,3,4: that must come first, then that, then that… But actually… It is also up to me! I can start to think about paragraph 4 if it’s about how we should work.

In her story Fia referred to the template several times. She discussed how her school management has decided that a specific template has to be used when planning, largely to be able to collect the plans and thereby “see what is happening”. Time is another constraining factor for Fia, regarding both
individual and collaborative planning. Colleagues are resources in Fia’s planning, and she would like more cooperation with them, also in her short-term planning. She also highly values spontaneous exchanges of ideas and experiences.

Fia’s work with planning varies throughout the year. At the beginning of the school year she generally has more energy, but in the final weeks, particularly for the for the ninth graders, Fia tends to perform what she calls “spontaneous planning” – that is, decides immediately before lessons what she will do. Fia argues that “spontaneous planning” can be good; the creativity that she sacrifices with templates can bloom in “spontaneous planning”, and this also affords greater opportunities for student participation.

Having two groups of the same grade level at different times of the day has made Fia aware of how much the schedule influence her planning. She has also experienced how other activities planned for the students (including field days, theater visits, project periods) steal time from her mathematics teaching and thereby affect her planning. If Fia were allowed to decide upon the schedule, then she would plan for more teaching situations with one or two students. One year she had opportunities for such occasions in her schedule and felt that they helped the students very much.

The availability of materials is another factor that influences her planning. Fia discussed an occasion when she was sitting with a small group of students in a room beside the main classroom while the rest of the class was supposed to work in pairs with problem solving and show their solutions on small white boards. However, since there were enough white boards for all students, each student took one and worked individually instead. For Fia, that occasion exemplified how a teaching situation is a meeting between planning and reality and how the outcome can differ from what was intended.

When planning, Fia makes several decisions, including what mathematical content to cover, how to relate that content to students’ everyday lives, and how to work with the content. Referring to a film that she has shown several times, she expressed how good activities can be used several times with different focuses. Besides decisions directly related to the concrete teaching situation, Fia has considered how to adopt an overall special education perspective in her long-term planning, which she thinks can benefit all students’ learning. Planning can help to “play it cool” and break norms about mathematics teaching. Fia gave examples when she has planned for working with a couple of students at a time although she had a lesson for the whole class, or when she has used the same film on several occasions for the same students. For Fia, planning is always about prioritizing and is related to feelings. She expressed how care for the students and their learning is critical when making decisions and how her own fears and energy level influence how the planning is done. Fia is constantly reflecting on previous experiences and how those experiences can be applied in future plans. She believes that even more reflection for example, after spontaneously planned lessons can be a good way to take advantage of good experiences instead of letting them go to waste.

Fia describes a practice in which the way of talking about planning in mathematics is frustrating. Some ways of planning are more valuable than others, and Fia almost excuses herself for sometimes doing what she calls spontaneous planning. Knowing that other actors might have comments influence her way of thinking, and, according to Fia, changes in teaching can lead to questioning from for example parents and students. In her notebook, she had written about how she wanted to include a special education approach in her long-term planning. She had also written: “Do I dare? Do I have
the energy?” Fia said that those considerations represented fears that not all students will be challenged and that she will have to argue for her choices. Fia thinks that she has the authority to make decisions about the teaching, but that exercising that authority takes energy.

**Analysis and discussion**

Reading Fia’s story in the light of *meaning* defined as “a (collectivity of) subjects’ way of relating to – making sense of, interpreting, valuing, thinking, and feeling about – a specific issue” (Alvesson et al., 2000, p. 1147) makes it possible to conceive how she constructs meaning and makes sense of planning in mathematics by choosing topics to discuss, by interpreting the practice of planning, and describing what she is doing and what is important for her. She discussed how choosing mathematical content and ways to present and work with that content always are part of her planning, as well as how good activities can be re-used with a different focus. Also related to the *practice of planning* is how she uses, and wants to use, reflections to benefit from past experiences, and how planning can help her break norms about mathematics teaching.

Besides describing the practice of planning itself, Fia constructed meaning by, for example, discussing how decisions by school management regarding schedule, availability of materials, and templates influence her planning. From her story it is clear that she perceives models often emphasized as a support for planning (Goméz, 2002; Superfine, 2008) as constraints. This is possible to interpret as she is referring to a *practice of management*.

Visible in Fia’s story are also norms about how mathematics teaching “should be done.” Those norms influence her considerations and decisions and emerged in her story as an invisible idea of what counts as teaching in mathematics, but also as concrete examples related to opinions of students and parents. Interestingly, Fia has ideas that she thinks would benefit students’ learning, but she contemplates to abandon them because she worries about parents’ and students’ reactions. When referring to thoughts of mathematics teaching, Fia relates the practice of planning to a *practice of mathematics teaching*.

Closely connected to practice of mathematics teaching are the colleagues that Fia referred to several times. She talked about a desire to make more collaborative planning, and how colleagues can be resources also in spontaneous exchange of ideas and experiences. Those parts of the story can be interpreted as her referring to a *practice of mathematics teachers*, in which she sees herself as a part. In reality, the practice of management and the decisions made there to some extent determines how she can participate in the practice of mathematics teachers. The degree to which co-planning is valued in the practice of management clearly affects Fia’s schedule and how much time she has with her colleagues.

Fia’s story makes it clear that her actions and reflections within the practice of planning relate to other practices in different ways. Some of those relations are constraining and hinders Fia from planning the way that she wants, whereas others contribute positively to her planning in mathematics. Since those other practices influence her planning they also implicitly influence her students’ possibilities to learn. Although the teacher is ultimately responsible for the teaching, results show that there are other aspects that influence the planning and, in turn, what happens in the classroom. That dynamic needs to be taken into account when discussing mathematics teaching and forming development initiatives. Viewing teachers and situations in the classroom as isolated entities poses the undesired
consequence that other important aspects that also influence students’ possibilities to learn mathematics are neglected.

References


