Who plans mathematics teaching?

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Teachers plan and conduct mathematics teaching, and hence, are often seen as the key to change mathematics teaching towards a more equal and just activity. However, there are signs that other actors are also influencing the planning and thereby the mathematics teaching. To explore the influence of others, a focus group study was conducted and results from one of the group discussions are presented in this paper. The results show that there are individuals who are actors in the process of planning, but also organizational and material actors. There are also direct links from the actors that the teachers express to others, which means that these also influence the planning and the mathematics teaching. Hence, changing mathematics teaching is not just a matter of teachers.

It would be uncontroversial to say that all students should be given equal opportunities to learn mathematics in school. However, is not always the case. For example, in Sweden, although the Educational Act state students’ equal rights to learn, results from TIMSS 2019 indicate that students’ background and home conditions play a role in their learning in mathematics (Skolverket, 2020). In addition, the differences between different groups of students increase (Skolverket, 2020), which should be seen in the light of the fact that there have been initiatives, such as new national curriculum and a national educational initiative for in-service teachers, aiming at a more equal and research-based mathematics teaching.

Often curriculum materials are designed to promote reform in mathematics teaching and there are those who see texts such as the national curriculum as a way to govern teachers (Remillard, 2005). However, studies show that even if teachers use the same curriculum material their teaching is not the same (e.g., Remillard, 2005), which has been interpreted as a teacher’s aims are the result of interaction between the teacher and the curriculum material, and the aims are influenced by the material and the teacher and her characteristics (Remillard, 2005). However, mathematics teaching and teachers’ aims for teaching seems to be even more complex. When mathematics teachers plan, they are influenced by both formal and informal actors (Grundén, 2020) which means that what Remillard (2005) sees as an interplay between curriculum material and the teacher seems to be an interplay between the material, the teacher, and other actors.

In this paper, results from one focus group interview are used to exemplify how actors and networks of actors influence the way teachers plan for mathematics teaching. The results are used for a discussion about social and political dimensions of mathematics teaching that might have consequences for the possibilities of realizing the vision of an equal mathematics education.

Background

The idea of governing teaching and thereby implementing new ideas often builds on the assumption that what is stated in formal curriculum also is what is enacted in the classroom. Instead, Remillard (2005) suggests that teachers interact with formal curriculum, plan their teaching based on this interaction, and in the classroom situation transform the planned curriculum into enacted curriculum. This means that there is not a direct link between what is in formal governing documents and what happens in mathematics classrooms – the teacher and her decisions are in between.

Teachers have to balance between obligations and need to attend to many different tasks – all with different motives (Skott, 2004). There are demands imposed on teachers and at the same time teachers are responsible for the enactment of the curriculum and thereby function as the link between ideas about mathematics described in curriculum and research and the context and social surroundings (Skott, 2004). This mix of demands and responsibilities is referred to by Skott (2004) as “forced autonomy”.

Skott (2004) argues that when reform ideas are not implemented as intended this may be due to the teacher’s different motives for the activities in the classroom “that force him [the teacher] to pursue one of these at the expense of the others” (p. 253). Hence, teachers do not always act in the way they think benefit their students’ learning in mathematics the most. In the concept of forced autonomy lies a view of the teacher being at the center of curriculum enactment. However, in my research (Grundén, 2020) the complexity in the planning process is highlighted and teachers’ autonomy is called into question. Instead of forced autonomy, I used the term false autonomy which means that “the teacher has the task of planning, but not the full mandate to do so” (p. 83).

Planning for mathematics teaching can be seen as different things including choosing activities, producing manipulatives, and thinking about ideas for teaching (Grundén, 2020). In this paper, planning is seen as:

A situated process, hard to distinguish in time and place, that involves mathematics teachers’ socially embedded considerations, decisions, and reflections on and about future teaching (Grundén, 2020, p. 35).

Theoretical standpoints

As stated above, planning can be seen as an interplay between the teacher, material, and other actors. This view of planning as socially embedded implies that planning can be seen as a social practice. There are different ways of describing practices (e.g., Boaler, 2003; Fairclough, 2003; 2015; Grootenboer & Edwards-Groves, 2013), but what they have in common is that people are involved in interactions and activities. Fairclough (2015) also includes language and the material world, and in Fairclough (2003) a social practice is described as mediating the relation between potential events defined by structures and actual events. Hence, the social practice of planning with its people acting and interacting, using language and materials, mediates the potential events, i.e., the ideas promoted by structures, and the actual events, i.e., what happens in the mathematics classroom.
The people involved in a practice can be seen as actors which can be defined as “a participant in an action or process” (Oxford Dictionary, 2021) who is linked to capacity and space for actions and to the ability to act differently (Giddens in Johnson, 2001). An actor is, according to Enserik, Hermans, Kwakkel, Thissen, Koppenjan, & Bots (2010), “a social entity, a person or an organization, able to act on or exert influence on a decision” (p. 79) and the influence can be directly or indirectly. Actors “have a certain interest in the system and/or that have some ability to influence that system, either directly or indirectly” (Enserik et al., p. 80). In this paper, the description of an actor as someone who “exert[s] influence on a decision” (Enserik et al., 2010, p. 79) and the view of practices as including material world (Fairclough, 2015) implies that physical objects can be actors as well.

Method

The material in this paper comes from a focus group study with mathematics teachers. Focus group discussions is useful for complex issues that can be explored with richer material than individual interviews since the participants interact and react to each other’s statements (Carey & Asbury, 2012). Focus group material needs to be understood within the context in which it is produced as well as in relation to the larger social context.

In the focus groups, I wanted the participants – based on their view and experiences of planning – to reflect on and react to aspects that in a prior study (Grundén, 2020) were identified as related to planning for mathematics teaching as well as aspects and reflections that came up in the discussion. The aspects that were used as stimuli for the discussion were students, school management, national tests, template/forms, parents, and textbook. The study involved six groups with a total of 27 mathematics teachers. All groups got the same stimuli. In this paper results from one of the groups – consisting of six teachers working in school year 1–3 – is presented and discussed.

Each focus group discussion started with me putting notes in the middle of the table. On some of the notes I had written an aspect, others were blank. I told the participants that teachers in a previous study had identified the aspects as related to planning in one way or another. I asked the participants to consider whether any of the aspects were related to planning for them, and I also told them that they could add aspects they thought were missing or remove aspects that did not relate to planning for them.

When the teachers started to talk, my role was to ask clarifying questions, follow-up questions, invite all participants to the conversation, and through gestures and small words confirm that I was listening. The group presented here did not remove or add any aspects on the empty pieces of paper.

Analysis

The aim in this paper is to describe in what ways actors and relations between actors might have consequences for changing mathematics teaching, and hence, in the analysis I needed to identify actors, see what they do in the planning process and see in what ways they are connected to other actors.

Enserik et al. (2010) describe different techniques to identify actors, one of which being the reputational approach, in which key actors are asked to identify important actors.
However, it is only possible to talk about the actors you are aware of which means that there is a risk that actors’ implicit influence on planning for mathematics teaching might not be identified. Instead of asking key actors – in this study the mathematics teachers – for actors influencing planning the teachers were asked to talk about planning with the help of stimuli, i.e., aspects earlier identified as related to planning and the identification of actors was done by me in the process of analysis.

To identify actors in this study the definition of actors as *participants that influence a process* – in this study the process of planning – was used. This means that just because the teachers talked about one of the aspects that were used as stimuli, the aspect was not identified as an actor. It became an actor if the teachers talked about what it did in the process of planning. For example, the group started to talk about students – which was one of the words on the notes – and their differences but it was only when they said that students’ differences led to a situation where the teachers could not plan, for example, problem solving when they were teaching the whole class, that students were considered an actor. An example of an aspect that was not considered as an actor was parents. The group talked about parents as having opinions about the mathematics teaching but did not explicitly say that decisions in the planning process were influenced by the opinions.

Inspired by Enserik et al.’s (2010) description of actor analysis, guiding questions for the analysis procedure were developed. The questions were:

1. Who/what is doing something in the process of planning?
2. In what way(s) does the “who/what” participate in the planning process?
3. What relations between actors are expressed by the teachers?

The results are based on the first three steps but for the purpose of the discussion another question was used.

4. What known and obvious relations of importance for the process of planning exists between actors?

In the analysis, the transcript was read with the first two questions in mind. Sections where the teachers talked about something that somehow had consequences for decisions in the process of planning were marked. The actor was highlighted in one color, and the participation in another, and expressed relations with other actors were marked in a third color. In the process of identifying known and obvious relations, yet undetected actors emerged. In Table 1, examples from the analysis are presented with the actors in bold.

<table>
<thead>
<tr>
<th>Action</th>
<th>Relations - expressed</th>
<th>Relations – known and obvious</th>
</tr>
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<tbody>
<tr>
<td>The textbook gives the structure of the teaching, [e.g., how the mathematical content is distributed over the school year]</td>
<td>Students love the textbook Skolverket (the National Agency of Education) has approved the textbook. Some parents want us to work faster in the textbook</td>
<td>Authors has/have written the textbook A publisher has published the textbook</td>
</tr>
</tbody>
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Table 1: Examples from the analysis.
Results

This section starts with a presentation of the actors that were identified in the focus group discussion and a description of the actions that these actors do in the process of planning. The section ends with the relations between actors that the teachers expressed.

Actors

There were several actors identified in the analysis, and an overview of them all can be found in Figure 1. In this section, the most prominent by virtue of how often it showed up in data are presented in more detail.

In the group discussion, the teachers seem to agree that students are important actors in the planning process. However, students are actors in different ways, and in the material, two main themes were found; students’ differences require adjustments and students’ needs guide the planning. Adjustments made in the planning process are, for example, based on different tasks being suitable for different students, that students’ knowledge of Swedish affects their ability to understand written tasks, and that some students need challenges. What students need to achieve the stated curricula goals is something that according to the teachers highly affects the planning, and what they need is based on their prior knowledge. The teachers also said that students have the right to be prepared for what comes on the national tests.

The textbook emerges as an ever-present actor in the planning of mathematics teaching. According to the teachers, the textbook governs the structure of the teaching, what content is to be included, and when to work with that content. In the planning process, the textbook also acts as a source for tasks. The book is even described as a savior, although it also appears that the book has shortcomings that make the teacher in the planning process look for material elsewhere. When teachers want to supplement the textbook, they turn to different media – including websites and TV-shows from public service – and colleagues for inspiration and activities.

The national tests and assessment support material issued and regulated by Skolverket (the National Agency of Education) are actors in the planning process partly because the teachers are planning to “teach to the test”, i.e., preparing students for the standardized tests. The tests and the support material are templates for what content is to be covered in the teaching. The presence of the tests also makes the teachers plan for repetition before the tests are carried out. The tests are actors also in organizational aspects. Carrying them out takes several lessons, and the teachers emphasize that time they could have spent on teaching and developing students’ knowledge is wasted. Parts of the tests should be conducted with individual students or smaller groups of students, which means that the teachers have to plan for the other students. On the one hand the teachers emphasize this as problematic – they have to rely on a resource person to take care of the students while they conduct the test – and on the other they appreciate being “forced” by the regulations to plan for meetings with individual students or small groups of students.
An actor also mentioned in the discussion is mathematics as a school subject. The subject leads to that teachers plan for a teaching where the students work more independently than in other subjects. The planning also varies depending on which parts of the mathematical content are to be dealt with. For example, some content requires that tasks in the book are supplemented with other tasks. The content also might change which activities are planned for, and how much time is spent.

Although the teachers describe that an in-service development program called Matematiklyftet did not lead to any lasting changes, they state the program as an actor that has really changed not only the teaching they planned for, but also the process of planning. In the discussion, the teachers emphasized that during the program they did not rely on the textbook as much as they usually do, and they also talked about the introduction of a reflection phase in the process of planning. The teachers also talked about one page in a learning management system as an actor. Structure and goals from the textbook were available and used by some as a base for planning.

Relations between actors

When it comes to teachers’ expressed relations between actors, the most prominent ones are related to the textbook. Firstly, students and the textbook with its teacher guide are related to each other in that tasks in the book need to be considered in relation to students and that different students approach the book in different ways. A statement in the discussion, namely “Students love the textbook”, witness a relationship in which the students appreciate working with the textbook. Not only students, but also parents, are highlighted by the teachers as actors who appreciate the textbook and thus can be said to have a relationship with it. According to the teachers’, there is also a relation between the textbook, the national curriculum, and Skolverket, so that textbooks are in line with what is stated in the national curriculum. The teachers also emphasize that Skolverket evaluates and approves textbooks1. Another actor is a learning management system in which there is a matrix with goals related to the textbook. The matrix is not published by the textbook publisher but made by “someone”.

“Someone” emerges as an actor related to a national assessment support material because “someone” has decided that it must be conducted with all students. There is also an expressed relation between Skolverket and the support material. Skolverket should, according to the teachers understand that the guidelines for implementation of the assessment support material, pose concerns for teachers in planning. When conducting the assessment support material, there is according to the teachers a need for an extra teacher or a resource person to take care of the rest of the class.

In Figure 1, there is an overview of the actors and relations that were identified in the discussion in the focus group presented in this paper. The actors that have a direct impact on the teachers planning are on the periphery of the circle, actors mentioned by the teachers being related to the peripheral actors are outside the circle. Relations between actors are represented by lines between the actors.

1 In Sweden, there is no review of textbooks and thus no guarantees that they meet the national curriculum.
Discussion

The discussion starts with a description of known and obvious relations between actors that appear in the teachers’ stories and other actors, followed by a discussion about the influence of actors and relationships on planning in relation to the vision to develop mathematics teaching towards a more equal and just phenomenon.

Known relationships between actors

In addition to expressed relations, there are relations of importance for the planning between actors that are known and obvious (see Figure 2). These relationships are important to emphasize in order to get a more comprehensive picture of the influence. The textbook is emphasized as an actor influencing the decisions teachers make when planning. The textbook is related to students, parents, national curriculum, and Skolverket. Known and obvious relations to the textbook are that authors write the textbook and a company publishes it, teachers or others decide to buy the textbook. Other prominent actors are the mandatory assessment support material and mandatory national tests, which are related to
politicians who have decided that they are mandatory, and to Skolverket\textsuperscript{2} because they design and administer them. The tests are also related to national curriculum. There is also a relation between the assessment support material, national tests and school leaders who are the ones that appointing funds for the resource persons the teachers say are required to implement the tests.

\textbf{Figure 2}: Actors in the process of planning and expressed and known and obvious relations between them.

In Figure 2 it becomes visible that decisions teachers make in the process of planning are influenced by many actors. What also becomes visible is that the actors who have relationships with most other actors are the textbook, assessment support and national tests, and Skolverket.

The network of actors that emerges in the analysis of the teachers’ discussion provides a reason to question the view of the teacher as an autonomous implementer. Not only does a

\textsuperscript{2} Here Skolverket is regarded as the actor although there are individuals employed by Skolverket that are acting.
teacher interact with curriculum materials as Remillard (2005) states, but there are also several actors involved in the decision-making process.

The textbook is an actor present in many of the decisions about planning. Important to bear in mind is that the teachers express relations between the textbook and Skolverket and between the textbook and the national curriculum that do not exist. It seems like the teachers trust the textbook more than themselves, which may seem logical given that the teachers think the textbooks are approved by Skolverket. Instead, in the long run, the teachers put their trust in authors and publishers. Even if there is no review and control of textbooks in Sweden, it seems reasonable to believe that these actors have an interest in contributing to students learning in best possible ways. However, these actors also have financial interests in selling as many textbooks as possible, which might mean that publishers are more willing to grasp trends than to profoundly change mathematics teaching.

On a couple of occasions in the discussion, someone appears as an actor that the teachers put their trust in. For example, when the Learning Management System appears as an actor and the teachers describe how they use a matrix in the system. The teachers use the matrix for planning but do not know where the matrix comes from. However, they “trust it fully” and “it follows the book”. Another example of when someone is an actor is when the teachers search for material and activities on social media or on a website.

Teachers rely on actors with formal power – for example when they mention Skolverket – but also on actors such as authors, publishers, and “someone”, that do not have formal power and might have an agenda not in line with what is best for students’ learning based on research and national curriculum. The results give the impression that the teachers seem to have more trust in others than in themselves, even in “someone” they do not know who it is. “We fully trust that it is OK! It is well thought out!” The results speak against the image of the teacher as an implementer of ready-made ideas from formal decision-makers and suggest a broader understanding of Remillard’s (2005) idea of the teacher as interacting with curriculum material. It is not enough to see the teacher as a key to change in mathematics teaching. Rather, the result supports the idea of false autonomy (Grundén, 2020) and to promote changes in mathematics teaching focusing on teachers is not enough. Those who want to contribute to a more equal and just mathematics teaching need to work to ensure that actors with knowledge of mathematics teaching are the ones who make decisions, and we as researchers need to address our research also to other actors who influence decisions in the process of planning for mathematics teaching.

References
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