

How teachers interact and use teacher guides in mathematics – cases from Sweden and Iceland

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Recent research findings show that curriculum resources have a potential to support teachers' design of lessons. The aim of this study is to investigate how Icelandic and Swedish teachers interact with and use teacher guides while planning their teaching. Five teachers in each country teaching lower grade levels (1–6) were interviewed about their utilization of teacher guides. The analytical tool used to analyse the teacher guides and the interviews focused on the different features of the guides and shed light on what the teachers were looking for in the guides and for what purpose. Our findings showed that teachers using educative teacher guides were more likely to use a wider range of lesson design considerations in contrast to teachers using traditional teacher guides.

An emphasis on curriculum materials is growing within mathematics education research and it is well known that the design of textbooks and teacher guides has a strong impact on how teaching, learning and classroom practice are orchestrated (Ball & Cohen, 1996; Davis & Krajcik, 2005). Notwithstanding the strong position of this kind of research, a specific focus is lacking, especially in relation to the teacher guides. Previous studies have mainly focused on how teachers use curriculum materials and the latter's role in relation to the mathematics classroom (Pepin, Gueudet & Trouche, 2013; Remillard, 2005). According to Brown (2009), few international studies have focused on how and what teachers use in terms of the collaborative relation between the teacher and the curriculum materials. The current research focuses on this relationship by

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studying the way in which Icelandic and Swedish mathematics teachers express how they use teacher guides. Both the guides and the interviews are analysed by means of a tool adopted and modified from science to mathematics by Hemmi et al. (2013) on the basis of Davis and Krajcik's (2005) framework on educative teaching materials. Davis and Krajcik, in their turn, drew on the work of Ball and Cohen from 1966.

Our study builds on the idea that curriculum materials constitute an important resource for mathematics education (Brown, 2009; Davis & Krajcik, 2005; Remillard, 2000, 2013). A recent study in Iceland shows that Icelandic teachers use teacher guides and find them useful (Haraldsdóttir, 2013), while according to Jablonka and Johansson (2010), Swedish teachers use the textbook to a very large extent and seldom use teacher guides. One rationale for undertaking a comparative approach is that, through a process of investigating similarities and differences in different countries' curriculum materials and their usage, we reveal some taken-for-granted and hidden aspects of teachers' work (Andrews, 2010). Such findings could contribute to and influence the international research discourse on aspects of curriculum materials and lead to an increased understanding of how curriculum materials, teacher learning, teacher education, culture, etc. are related to, and constitute each other. Our research question is:

- How do Icelandic and Swedish teachers interact with and use teacher guides while preparing for their teaching?

Since the study's results are based on semi-structured interviews with teachers, the results can only reflect the participating teachers' perceptions and experiences about their use of teacher guides. Embedded in the research question are aspects of teachers' perceptions of the usefulness of teacher guides for the design of teaching, as well as teachers' perception of their own interaction with the teacher guide as a resource for teacher learning. We approach this investigation from a theoretical stance, which holds that teacher guides are artefacts with power to shape human activities (Brown, 2009; Vygotsky, 1986). A consequence of that view is that teachers and teacher guides interact in a participatory relationship where both the characteristics of the teacher and the characteristics of the teacher guide influence the educational outcomes in classroom practice (Brown, 2009; Remillard, 2005). Before we elaborate further on the design and results from the study, we will present previous studies on the role of curriculum materials as artefacts in mathematics education and teacher guides' potential to support teacher learning.

The role of curriculum materials

Textbooks and teacher guides are part of curriculum materials and used by teachers in their planning and actions (Jablonka & Johansson 2010; Stein, Remillard & Smith, 2007). They also have a strong potential to support teachers' design of classroom practice (Ball & Cohen, 1996; Davis & Krajcik, 2005). Mathematics textbooks are one of the most important artefacts in mathematics education (Fan, Zhu & Miao, 2013; Pepin & Haggerty, 2003; Thomson & Fleming, 2004). The main focus in curriculum research has been on the textbook itself; its structure, content and its influence on reform. The textbook structure provides the teacher with a sequence of tasks and topics that serve as an interpretation of the national curriculum. Research has shown that teachers rarely change the order presented in the textbook when they plan their teaching (Thomson & Fleming, 2004) and they often start from page one and follow this path through the textbook, believing that they are working in an effective way towards the goals of the national curriculum. Textbooks are not only artefacts that maintain and control the curriculum, they also have the potential to change and transform the curriculum (Collopy, 2003; Remillard, 2000). Dole and Shield (2008) establish that "textbooks are a resource to support the teaching and learning of mathematics, and also have the capacity to promote pedagogic and curriculum reform" (p.32). This knowledge is relevant under the presumption that textbooks in general align with national curriculum goals.

Along with the textbook, the teacher guides are available for teachers in their planning process and play an important role in mediating ideas about instruction. They can also contain materials that teachers can use as a basis for their reflections and decisions. Remillard (2000) and Brown (2009), as well as Davis and Krajcik (2005), have studied the possible impact from curriculum materials and found that they offer a potential for designing educative support for teachers. The authors of curriculum materials interpret the national curriculum and represent them in textbooks and teacher guides (Gunnarsdóttir & Pálsdóttir, 2010). It is important to know how teachers understand these representations and how they constrain and afford their practice (Brown, 2009). Brown states that classroom instruction relies on the collaboration between curriculum materials as tools, which convey curricular forms, concepts and practices, and the teacher's personal resources, such as subject matter knowledge, goals and beliefs. Teacher guides can promote a teacher's pedagogical design capacity, or his/her ability to use personal resources to adapt the curriculum to achieve productive instructional ends. Further, it can support the teacher's ability to act in practice by suggestions in terms of the design and the enactment of lessons, tasks, formative assessment,

individualization of teaching, homework, etc. (Hemmi et al., 2013). Teachers actively mediate and develop their relationship with teacher guides in different ways according to their ideology as well as historical, social and cultural factors (Brown, 2009). Teachers adjust their personal ideas and ideas from teacher guides to the socio-cultural settings of their classroom, based on their experience, goals and competences. This process indicates that teacher guides can contribute to teachers' learning and professional development (Doerr & Chandler-Olcott, 2009). This is also sustained by a recent study by Cobb and Jackson (2012), in which they suggest that the role of curriculum materials for teacher learning is crucial both in their practice and in institutionalized professional development.

Teacher guides' potential to support teacher learning

Several researchers have pointed out important aspects, which contribute to effective professional development for teachers (Darling-Hammond et al., 2009; Desimone, 2009; Loucks-Horsley et al., 2010). According to Loucks-Horsley et al. (2010), effective professional development is designed to address students' learning goals and needs and is driven by ideas of good classroom learning and teaching. Professional development should also give teachers opportunities to develop both their content and pedagogical content knowledge and inspire them to inquire into their practice. Desimone (2009) focuses on five main features of professional development: content, active learning, coherence, duration and collective participation. There is strong evidence indicating that focus, in professional development, on the ways students learn content can be linked to teacher learning. Active learning, where teachers engage in various activities like observations, reviewing of student work and discussions, is also an important feature. Teachers need to feel that there is coherence between their views of good teaching, their knowledge and experiences in professional development and between reforms and policies at all levels. Collective participation and time are also very important features. Teachers need time to work with, reflect on and try out new ideas and they need to do this in a learning community with others dealing with the same issues (Desimone, 2009). According to Davis and Krajcik (2005), teacher learning involves developing and becoming able to use one's knowledge base about content and how this content is taught and learnt. It also involves participation in the discourse of teaching and various teacher practices. Teacher learning is therefore always situated in teachers' practice. Curriculum materials, in our case teacher guides, can become tools that teachers use to support their learning and professional development on their own or in collaboration with others. Davis and Krajcik (2005) point out

aspects that characterize the curriculum materials, which are designed for promoting teacher learning and can therefore be termed as educative curriculum materials. They present five main ideas:

- The materials give teachers ideas regarding learners' thinking and how they might react to activities.
- The materials sometimes give the teachers new ideas on how to approach a subject matter and help them to develop their own understanding of the matter.
- The materials help teachers connect different mathematical ideas and see the larger curricular picture from reflecting on objectives, tasks and discussion in teacher guides.
- The materials help the teachers to make their choices in teaching more visible.
- The materials support teachers in developing their teaching design building on their personal resources embedded in the materials.

The analytical tool used in this research is based on these ideas.

Davis and Krajcik (2005) developed *Design heuristics for educative curriculum materials for science teaching*. Hemmi et al. (2013) have modified and adopted the framework of Davis and Krajcik (2005) into an analytical tool for analysing curriculum materials in mathematics on the basis of the work of Davis and Krajcik (2005). The tool is modified to fit the purpose of analysing teacher guides in mathematics and has been tested by analysing Finnish and Swedish teacher guides (Hemmi et al., 2013). The analytical tool focuses on the opportunities for teacher learning provided by the teacher guides. It consists of five categories and is described in table 1. The analytical tool, described above, is used in the data analysis to draw attention to the teachers' expressed usage of the teacher guides.

In previous studies in Iceland and Sweden, the tool has been used for analysing both teacher guides and interviews with teachers with the aim at understanding better how teacher guides and teachers' use of teacher guides interact. The Icelandic study (Gunnarsdóttir & Pálsdóttir, in press) showed that teachers used two different types of teacher guides, namely, *Eining 2* (Ingimarsdóttir & Pálsdóttir, 1999) and *Geisli 2* (Angantýsdóttir, Gunnarsdóttir, Kristinsdóttir & Pálsdóttir, 2011) or *Sproti 3* (Alseth, Arnås, Kirkegaard & Rösseland, 2012) and *Stika 1* (Alseth, Nordberg & Rösseland, 2011). Based on the analysis, it can be concluded that the guides *Eining* and *Geisli* give the teachers opportunities for teacher learning and we have therefore characterised them as educative teacher guides. *Sproti*

Table 1. *Categories for data analysis; opportunities for teacher learning*¹

Categories	Categories for data analysis
1a) General knowledge of students' ideas and strategies	Describes why students might hold particular ideas about mathematical concepts and exemplifies common strategies among students.
1b) Suggestions for how to encounter students' ideas and strategies	Gives suggestions for how to deal with/encounter various ideas and strategies of students and how to enhance their learning and prevent future difficulties.
2) Concepts and facts	Describes concepts and facts within mathematics such as history, field of application, derivations, methods, proofs, correct terminology.
3) Progression and connections	Shows the mathematics progression throughout the school years as well as connections between mathematical topics; for example, explaining the future development of methods and concepts.
4) Connecting theory and practice	Supports the teacher's actions in practice beyond the curriculum materials by connecting theory and practice. Exposes the central ideas in national curriculum and research results for promoting teachers' autonomy.
5) Design of teaching	Supports the teacher's ability to act in practice by suggestions with respect to the design and enactment of lessons, tasks, formative assessment, individualization of teaching, homework, etc.

and *Stika* focus on the design of teaching and support teachers in individualising the teaching and provide the teachers with ideas for games and extra activities. However, they offer little space for theoretical discussion of mathematics teaching and learning, and are therefore characterised as traditional teacher guides. The page-by-page guide to *Eining* also supports teachers in planning each lesson, but in *Geisli* more is left to the teacher to decide (Gunnarsdóttir & Pálsdóttir, in press).

In the Swedish study (Ahl, Hoelgaard & Koljonen, in press), teacher guides from two of the most commonly used series, *Matte Eldorado 1A* (Olsson & Forsbäck, 2011) and *Matte Direkt Safari 1B* and *3B* (Falk, Picetti & Elofsdotter, 2011a, 2011b) were analysed. According to the analysis, the content of *Matte Eldorado* provides the teacher with good opportunities for teacher learning. All the categories for educative curriculum materials are present in different scopes. The teacher guides for the *Matte Direkt Safari*, on the other hand, focus mainly on the design of teaching. They guide the teacher through the student textbook and offer the teacher limited opportunities for teacher learning and cannot be categorised as educative curriculum materials (Ahl et al., in press).

The teacher guides from both countries that we characterised as educative have similar features. They have introductory chapters on mathematics teaching and learning where the focus is on how children develop their understanding of mathematical topics and ideas about

teaching approaches for young children. In the other teacher guides, the main focus is on how to guide students through the textbooks and are therefore characterised as traditional.

In our literature review, we have presented studies on the use of curriculum materials and of teacher learning. As can be seen from that overview, the focus in curriculum research was not placed on teacher guides or their role in teacher learning.

Methodology

In this study we use interview data from our previous studies in our respective countries on teacher guides and their use (Gunnarsdóttir & Pálsdóttir, in press; Ahl et al., in press). The focus is on how Icelandic and Swedish teachers interact with teacher guides and whether they use opportunities for teacher learning provided by the teacher guides. The same framework (Hemmi et al., 2013) was used for analysing the interviews in each country. We conducted separate analyses from both countries (Gunnarsdóttir & Pálsdóttir, in press; Ahl et al., in press). Then we approached the separate analyses as a whole using the framework to shed light on how teachers interact with particular features and characteristics of teacher guides (Remillard, 2005, 2013), while comparing the teachers interactions with teacher guides characterized as educative (Eining, Geisli and Matte Eldorado) or teacher guides that cannot be seen as such (Sproti, Stika and Matte Direkt Safari).

Data and data analysis

We collected our data by interviewing five teachers, in each country, who taught mathematics in lower grades (1–6) in compulsory school. Those teachers represent a convenience sample (Bryman, 2012) in light of the fact that we approached schools where we had already established contacts with teachers. We contacted some schools in our neighbourhood that used different curriculum materials and asked for volunteers to take part in a study on how they used teacher guides. Consequently, the study only included teachers that use teacher guides. The teachers taught in different schools, some had long teaching experience and some had worked only a few years in the profession. In Iceland, none of the teachers had specialised in teaching mathematics but in Sweden two of the teachers had some degree of specialisation in mathematics education (60–90 ECTS). All the teachers were female. This was not intentional but in both countries very few men teach in the lowest grades. The teachers were given pseudonyms to protect their privacy.

In the semi-structured interviews, the teachers were asked questions concerning how they begin their planning; how they use their teacher guides; what parts of the guide they commonly use; what they value in the teacher guides and what they would like to see included in the guides. All researchers prepared the interview questions collaboratively. The same researcher in each country conducted all interviews. All interviews were audio taped or filmed. They were transcribed separately and analysed according to the analytical tool by the researchers in each country.

In both countries, the teachers used two different types of teacher guides which we have characterised either educative or traditional. The researchers were familiar with both the guides and the textbooks the teachers refer to. Furthermore, the Icelandic researchers are co-authors of two of the teacher guides. By preparing the research format in collaboration with the Swedish researchers and using a common framework for analysing data, the Icelandic authors were able to distance themselves from the object of study (the teacher guides). However when being a known member of a small mathematics education community it is hard to avoid influence from prior work. Therefore it is important that this is known to the reader. We believe that it is both a strength and a weakness for the researchers to be familiar with the object of study when conducting the analysis. We can easily visualise what the teachers are talking about, however, at the same time we cannot disregard our own experiences with the teaching materials, even though we want to.

We adopted a holistic approach in order to get closer to the analysis, given that we strive to understand the collaborative relationship between the teacher and the teacher guides (Patton, 2002). The *first step* in the analysis is to read the whole content over and over again until an understanding about the content of each interview emerges. This analysis aims at obtaining a general overview of the interviews. The *second step* is to reveal the construed categories 1–5 in the interviews, by using the analytical tool. This analysis aims at connecting the content of the interviews to the educative potential of the teacher guides. In the interviews, we looked for quotes that corresponded with the specific categories in the analytical tool. Did the teachers mention things that indicated that what they were looking for in the guides was material that supported them in a way suggested by the framework? For example, could we find evidence that the teachers were looking for material that gave them ideas about how to encounter students' ideas and strategies (Category 1b), material that provided them with knowledge about mathematical concepts and facts (Category 2), or were they primarily looking for ideas about the design of teaching (Category 5)? To avoid bias as far as possible, researchers

in each country conducted the analysis together, checking each other's understanding of the interviews and the teacher guides.

Identifying different use of teacher guides

In this section, we will offer excerpts that support our main findings with regard to the research questions posed in the introduction, namely, that both Swedish and Icelandic teachers use educative teacher guides differently from traditional teacher guides. As described before, we approached this investigation from the social-cultural perspective, which views curriculum materials as artefacts that have the power to shape human activities (Brown, 2009; Vygotsky, 1986). We will recall and further elaborate on the role and influence of artefacts in the discussion section.

First, we want to note that that the Swedish teachers Berit, Doris and Erika and the Icelandic teachers Anna, Birna and Dóra, use the traditional teacher guides *Matte Direkt Safari* (Swedish) and *Sproti* or *Stika* (Icelandic). The Swedish teachers Annika and Carina and the Icelandic teachers Eva and Freyja use the educative teacher guides *Eldorado* (Swedish) and *Eining* or *Geisli* (Icelandic). All the quotes from the interviews were translated into English from Swedish and Icelandic by the authors of this paper.

Teachers' use of traditional teacher guides

To capture the way in which the teachers use their teacher guides was the goal of the interviews. In the following, we display selected passages from the interviews that enlighten the picture painted by our analysis:

Birna: I read it at home this summer – this is a brand new book – and saw that it had lots of suggestions for more difficult or easier problems². I saw right away that this is a slightly individualised book ... To each page in the book, the guides often have some stories and starters and all the extra problems that are there.

Birna is talking about how the teacher guide works for her together with the textbook. She expressed satisfaction with the structure in the guide that follows every page in the textbook. She is also happy with the scope of the different levels of difficulty that are represented and she points out that it is important that the guide explained every problem in the textbook (category 5). She says that:

Birna [...] it guides the teacher through the book

She said this with appreciation, and we concluded that Birna is happy with a guide, that serves as a manual for how to work with the book. Whether she considers the book to be true to the curriculum i.e. whether it is possible to rely on the textbook together with the teacher guide to fulfil the goals in the national curriculum, we were unable to conclude from the analysis. However, we know that most teachers rely heavily on textbooks and teacher guides for the interpretation of the national curriculum (Thomson & Fleming, 2004).

Unlike Birna, who appears to be true to the textbook and teacher guide, from the first page and onwards (Jablonka & Johansson, 2011), Anna, Dóra, Berit and Doris had a different approach:

- Anna: This is more like ideas, what ideas I can use, how I can use them and how I can adjust the ideas in the book to my context
- Dóra: The biggest advantage I feel are the practical problems and the more difficult problems that we often have used in workstations [...] They also sometimes take you out of the box ...
- Berit: We use the pictures and talk about them. I use practical exercises. I want more of those.
- Doris: I use copy materials. I construct booklets from them with different difficulty levels.

These excerpts paint a picture of teacher guides as a source from which the teachers could extract elements that they found suitable for their way of teaching. The teachers clearly addressed activities regarding the classroom practice (Category 5). They did not touch on the issue of whether a teacher guide can be a source for teacher learning. The teachers' statements downplay the guides' role as artefacts with the power to shape human activities. Used in this way, as a toolbox, the teachers will reject or ignore activities that do not align with their conceptualisation of how teaching should be carried out. Consequently, the teacher guides' potential impact on teaching decreases.

One of the interview questions addressed whether the teachers thought that the guide lacked support that could have been helpful for them when planning their teaching. In the following excerpts Erika expresses her view on this issue:

- Erika: The national curriculum is the starting point. It's a bit ... the goals for grade 3 are quite clear but what shall you do in grade 1 and grade 2? How much are you supposed to do in grade 3?
- Interv.: Would you be helped by clear connections to the curriculum?
- Erika: Yes! Now I start with the curriculum and compare with Matte Safari to see what's there and what's missing. It could be clearer in the teacher

guides and save me some time ... The guide doesn't cover everything needed. It's mostly count, count, count and it's not much problem solving. It doesn't cover enough, I think, or it has shallow descriptions. I want one that covers all the topics. I want to know: When you teach this you must pay attention to this and so on ... I want tips and tricks and hints about what ideas the students might have.

Erika expresses a wish for support with how to connect the teacher guide to the national curriculum, (Lgr11³) Category 3 in our framework. She also points out that she wants information about students' ideas and suggestions for how to deal with them (Category 1a and 1b). Furthermore, her wish for more problem-solving techniques shows that she wants support with a reformed classroom practice, with group work and discussions. This conclusion is drawn from the nature of problem solving, which emphasises collaboration between students and encourages verbal and written explanation for their reasoning. Based on Erika's words, we draw the conclusion that an educative teacher guide would serve her interest better than the traditional guide. Aside from Erika's explicit desire for mathematical connections, deeper descriptions and more problem solving, the other teachers, who used traditional teacher guides, did not mention this as a problem. Whether this results from the fact that it is hard to overlook something that you are unfamiliar with, or that the other teachers consider this to be redundant information, is not possible to answer in the scope of this analysis.

In sum, our findings show that five (Birna, Anna, Dóra, Berit and Doris) out of six teachers use the teacher guides as inspiration that facilitates the implementation of classroom practice (Category 5). One of the five teachers, Birna, was more positive than the others concerning the structure presented in the teacher guide. Still, Birna placed emphasis on implementation and solely refers to the guide and the textbook as a frame of reference for carrying out teaching. She does not reflect on whether the teacher guide could function as a source for teacher learning. The sixth teacher, Erika, expressed that the guide fell short of providing support in her teaching. She acclaimed that she sought a more substantial guide that can support her teaching practice as well as her teacher learning.

Teachers' use of educative teacher guides

A different picture than the one presented above arises from the interviews with the teachers who used educative teacher guides. In the following, we present selected excerpts from the analysis that highlight both these differences, but also similarities, with the teachers' use of the traditional guides shown above. The excerpts are chosen from all

five categories in the framework. We enter the interviews where two of the teachers discussed the theoretical introductions that, among other things, focus on students' ideas in the educative teacher guides:

Freyja: I find it good to have like an introduction where I can see things from the children's point of view ... The guide often pointed out what you have to emphasise with the children.

Eva: I find it good to have a short introduction about something that is important for this stage – but not too much.

Both Freyja and Eva appear to be positive regarding theoretical descriptions, although, Eva raises a finger against texts that are too exhaustive. Freyja feels that the guides support her in understanding the possible interpretations by the children, which seems important to her, given that she pointed it out in the interview (Categories 1a and 1b). This is not an easy task for teachers and they need support to interpret the presentation of concepts, facts and central mathematical ideas in the national curriculum (Category 2). It is clear that both Freyja and Annika turned to the teacher guide to deepen their insights about mathematical topics. This is in line with the intentions of educative teacher guides, which stress that curriculum materials can serve as a source for teacher learning (Brown, 2009; Desimone, 2009; Davis & Krajcik, 2005; Remillard, 2005). The next excerpts present the Swedish teachers' view on the emphasis put on connecting the teacher guide with the national curriculum (Lgr11):

Annika: The guide is clear about the connections to the national curriculum. It helps when planning. Then you have to adjust to the group you are working with. There are suggestions in the guide for how to individualise in the group.

Carina: Now, I looked at the guide thinking of the new curriculum. They have decomposed Lgr11 and tried to cover it. And I think they made a really good overview in this guide. They have different topics with relevant content. It's good support.

Both Annika and Carina valued the connection between the national curriculum, and practice (Category 4). One explanation for the Swedish teachers' appreciation for the coherence between the teacher guide and the national curriculum can be that they still struggle to interpret how to organise the core content across school years. In contrast to the Icelandic teachers, who have worked with the same curriculum since 1999 and are more familiar with it.

In the following excerpts, Eva and Carina talk about what elements they use from the teacher guides:

- Eva: I read them through and look at both the goals and if there are any extra ideas or problems I can use when introducing the topic, and I also looked at the additional ideas that the guide refers to ... What do they say about concrete work? What can I make them do? What is good to say, sometimes? It is not a problem for me – it is often: What more can I do – they are good at this – what can I do that is more exciting? Then I look at the additional ideas.
- Carina: I read the information to the teacher and then I choose exercises that are suitable for the group. I use the pictures and talk with the children about the mathematics ... in the picture. I pick stuff from the teacher guides.

Similar to the teachers in our study who used traditional teacher guides, Carina and Eva also use the teacher guides as toolboxes, searching for activities to put into play in classroom practice (Category 5). However, this is not the only way they use the teacher guides. Both Carina and Eva discussed other parts in the guides that they use (see above). As a result, this leads us to the conclusion that it is possible to use the different guides in similar ways. However, only the educative teacher guides invite the teachers to broaden their use of them in cases where they need a larger scope of support.

In sum, our analysis shows that the interviews with teachers who used the educative teacher guides provided answers that touch on every category in our framework. This counts for both Swedish and Icelandic teachers, although the Swedish teachers showed an increased interest for connections to the new national curriculum. The educative teacher guides offered a broader support than the traditional teacher guides. The interviewed teachers in our study embraced the extra dimensions of the teacher guides and used them as a source for teacher learning, as well as toolboxes with mathematical activities for children.

Discussion and conclusions

As explained in the introduction, our approach to this study assumes that teacher guides are artefacts with the power to shape human activities (Brown, 2009; Vygotsky, 1986). So, how do Icelandic and Swedish teachers interact with and use teacher guides while preparing for their teaching? Our analysis shows that both the Swedish and the Icelandic teachers, who used educative teacher guides, make use of the range of support (Categories 1 to 5 in our framework) offered by the guides (c.f. Brown, 2009; Remillard, 2005). Our main conclusion is that by offering educative features, the teacher guides invite the teachers to use the guides

in a participatory relationship. Our analysis showed how Annika, Carina, Eva and Freyja (who were using educative teacher guides) obtained ideas from the teacher guide that encouraged them to reflect over their design of lessons. However, these ideas were not ready-made classroom activities. For example, we saw in the analysis that Annika found inspiration to work with addition and subtraction at the same time, highlighting the inverse operation.

The results indicate that cultural or individual differences have a smaller impact than the design when it comes to how the teachers use the teacher guides. The main influencing factor on teachers' use seems to be the design of the teacher guides c.f. Stein and Kaufman (2010) whose findings suggest that the way in which teachers use curriculum materials may be more important than education, experiences and knowledge. We draw the same conclusion from the analysis, which shows that all teachers using educative teacher guides utilise the available support from all five categories in our framework. This result is in line with Ball and Cohen (1996), as well as Davis and Krajcik (2005), who found that an emphasis on educational features in curriculum materials could promote teachers' ability to design effective teaching. Materials, that not only provide resources for instruction, but also support teaching as a design process rather than depicting instruction as prefabricated procedures, increase teachers' lesson design capacity. Teacher guides should support teachers to consider key goals, relevant content, appropriate strategies, and available concrete materials (Brown, 2009; Remillard 2005). Altogether, this places a stronger emphasis on the interplay between the teachers and the teachers' use of resources (Brown, 2009). Our sample is small and the conclusion that the design of teacher guides has strong impact on how they are used, calls for further studies to be solid.

The teachers using traditional teacher guides use them to select activities for their classroom practice, category 5 in our framework. This is a consequence of the design of the traditional guides. They focus on offering ready-made activities for classroom practices. However, the teachers using traditional teacher guides in our study seem pleased with their guides, except for Erika, who explicitly demanded support from the other categories in our framework. We therefore end up with the classic question of what came first: the chicken or the egg? Are the teachers in our study content because they cannot imagine other designs of teacher guides or are they content because the guides offer the support that the teachers require? Drawing on the interviews with the teachers using educative teacher guides, together with our interpretation of teacher guides as artefacts, we believe that the design of the teacher guides constrains the way they are used. That is also in line with what Remillard (2005)

stresses, namely, that the features of teacher guides influence how the teachers interact with them.

This study was carried out in collaboration between researchers in Iceland and Sweden. It was fruitful to prepare the study in collaboration and discuss and compare our findings. The teacher guides have similar characteristics and the teachers also held similar views on the usefulness of the teacher guides for the design of teaching.

The analytical tool (Davis & Krajcik, 2005; Hemmi et al., 2013) was designed to analyse the educative potential of teacher guides. In this study, we used it to analyse interviews with teachers in relation to their use of teacher guides. The analytical tool was useful for the purpose of discovering what the teachers were looking for in the guides and for what purpose. By using it, we discovered some examples of how the teachers made use of opportunities provided in teacher learning. It also opened our eyes in regard to important elements of teacher learning, and at the same time, directed our focus toward those issues.

This study contributes to the knowledgebase about how teacher guides can be designed by authors with the aim of improving teacher learning and facilitating teachers' possibilities to improve their teaching. It is useful for those who write and publish curriculum materials to know how teachers use teacher guides as important artefacts that provide accessible opportunities for teachers' learning. This study indicates that this can be the case and that curriculum materials can be a valuable resource for teacher learning. Now we look forward to see the results from on-going research by our colleague Koljonen, who is currently investigating how Swedish and Finnish teachers use teacher guides for both planning and implementation in the classroom with their students. We believe this will further broaden our knowledge of teachers' use of their most important resources.

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Notes

- 1 Original heading in Hemmi et al (2013) is "categories for data analysis". In order to clarify what the categories are categories of we added opportunities for teacher learning, which is in line with the original in Davis and Krajcik (2005).
- 2 Note that Birna is not making a distinction between problems and exercises. However, being acquainted with the content in the book we want to clarify that it contains both exercises and problems.
- 3 Sweden has a new national curriculum since 2011.

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