

Scrutinizing Norwegian kindergarten teachers' considerations about talk moves

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Talk moves have been used as a communication tool for developing more productive mathematical discussions in school. To avoid uncritical adoption of a tool that was developed in a different context, it is important to consider cultural differences and concerns from the practice field. This study investigates group discussions among 15 Norwegian kindergarten teachers from seven kindergartens to explore how they understand talk moves, and what they consider to be possibilities and limitations of using talk moves in the Norwegian kindergarten context. We argue that kindergarten teachers' concerns about talk moves do not seem to warrant rejection, but that professional efforts are required for meaningful enactment.

The idea that a special form of classroom communication is particularly productive for children's learning is not new. Four decades ago, Barnes (1976) emphasized the role of exploratory talk as a core feature of productive classroom discussions – an idea that has later been adopted and extended by other researchers (e.g. Mercer & Hodkinson, 2008). In mathematics education, recent reform efforts highlight discussions that stimulate investigation in mathematics classrooms, and researchers have identified practices that promote productive mathematical discussions (Stein et al., 2008). Embedded in the conceptualization of principles and practices for leading mathematical discussions are so-called talk moves (Chapin et al., 2009; Kazemi & Hintz, 2014). Talk moves are conversational moves that teachers can apply to stimulate reasoning and attention to others' thinking in discussions (Michaels & O'Connor, 2015); an example is to encourage children to elaborate or clarify by using the talk move "Can you say more?" Talk moves aim at disrupting traditional patterns of communication – like that of initiation-response-evaluation

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(IRE), which is still dominant (e.g. Cazden, 2001) – and stimulate new and more productive forms of communication, such as discussion. Use of talk moves has proven to be effective in changing communication patterns and stimulating discussions in the school context (e.g. Chapin et al., 2009; Kazemi & Hintz, 2014). Our study aims at exploring the potentials for using talk moves in the Norwegian kindergarten context.

Theoretical background

There is a significant body of literature on language in mathematics education, and numerous studies have investigated various aspects of language use in school as well as kindergarten contexts (e.g. Gjems & Løkken, 2011). Among this body of literature, many studies highlight discourse in mathematics classrooms (for a review, see Ryve, 2011). The focus on discourse has also been prominent in several studies of mathematics education in preschool and kindergarten contexts. Some researchers have targeted the communication among kindergarten children (e.g. Breive, 2020; Fosse, 2016), whereas others have investigated how kindergarten teachers can support mathematical communication in preschools or kindergartens (e.g. Carlsen, 2013; Dovigo, 2016). These studies indicate that kindergarten teachers also use certain conversational moves, like revoicing and questioning, in their practice. Despite the existence of some studies in this area, Fosse (2016) calls for additional efforts to explore how kindergarten teachers can lead mathematical conversations in kindergarten.

Talk moves are not yet commonly used in the Norwegian kindergarten context. Based on previous research in the school context, a reasonable question to ask is whether and how talk moves might be useful in a Norwegian kindergarten context. Although such questions are simple enough to ask, it is challenging to provide a satisfying response. On a more general level, it could be argued that kindergartens differ from schools, and that adopting tools from one context into another is problematic; OECD (2017) warns against uncritically adopting practices from primary school into kindergarten contexts. Where some countries have teacher-directed kindergartens that highlight academic content, the Norwegian kindergarten tradition is more child-centered and play-oriented – to the extent that Norwegian kindergarten teachers even hesitate to describe their practice as “teaching” (Sæbbe, 2019; Sæbbe & Pramling Samuelsson, 2017). Differences like these need to be taken into account when considering the question of whether and how talk moves might be useful.

The *Norwegian framework plan* for kindergartens highlights communication as a means to stimulate children’s learning and development (Norwegian Directorate for Education and Training, 2017). The learning

area of quantities, spaces and shapes specifies that mathematical work in kindergarten should involve "asking questions, reasoning, argumentation and seeking solutions" (p. 53). Furthermore, it specifies that kindergarten teachers should "create opportunities for mathematical experiences by enriching the children's play and day-to-day lives with mathematical ideas and in-depth conversations" (p. 54). Carlsen's (2013) study of engaging children in mathematical conversations around a fairy tale is an example of this, and it seems like a pedagogy of talk moves might be useful in such a context. However, other principles underlying talk moves might be less fitting for the Norwegian kindergarten context. For instance, the Norwegian framework plan does not specify learning goals, and the principle of steering towards a specific learning goal in the pedagogy of talk moves does not appear to be a good fit in that sense. Another example is that talk moves are often used in classroom settings where the teacher leads a group of students in their efforts to investigate some prescribed content. Norwegian kindergartens do not have classrooms, and communication between children and kindergarten teachers normally occurs in informal everyday activities and play situations rather than in traditional lesson settings. Use of talk moves in the Norwegian kindergarten context is therefore not straightforward and requires careful consideration of how differences in educational traditions might provide affordances or constraints. To explore how such differences are perceived, and what they might imply in the Norwegian kindergarten context, we invited some Norwegian kindergarten teachers to discuss the possibilities of using talk moves to help us respond to the following research question:

How do Norwegian kindergarten teachers consider talk moves, and what do they identify as possibilities and limitations of using talk moves in a Norwegian kindergarten tradition?

To answer this question, we use a practice-based approach to investigate how kindergarten teachers take up the idea of talk moves. The conceptual framework of our practice-based study includes a view of teaching as a work that can be decomposed into several core practices, where leading discussions is one such core practice, and where talk moves constitute a tool that teachers can use when carrying out this practice. We elaborate on this below.

Conceptual framework

First and most foundational is a particular conception of teaching. We consider teaching to be a complex professional work (Cohen, 2011), which can be decomposed into a core set of practices that are often referred to

as "core practices" (Jacobs & Spangler, 2017). Core practices are described in the literature as routines or activities that teachers regularly perform, and that novice teachers have to learn. Various efforts have been made to list core practices of mathematics teaching, and the practice of leading discussions is often mentioned among the most prominent core practices of mathematics teaching.

The focus on discussion in mathematics teaching predates the notion of core practices, and it belongs to a long tradition of classroom research that highlights communication. In a classic study, Mehan (1979) described a common pattern of teacher initiation, student response, and teacher evaluation (IRE), which is different from discussion. Later, Cazden (2001) – who was the teacher Mehan observed – discussed the different communication patterns in "traditional" and "nontraditional" classrooms. Whereas traditional classroom teaching often follows the IRE pattern of recitations, nontraditional teaching typically involves discussions where teacher and students are more equal contributors (Cohen, 2011). The idea of using discussion in education is not new. For instance, Schwab (1954) was a strong proponent of discussion, and he argued that discussion "is indispensable to a good liberal education" (p. 51). In mathematics education research, numerous studies have investigated what is involved in leading productive mathematical discussions and how this practice can be learned (for a review, see Jacobs & Spangler, 2017).

In this study we adopt the following definition.

Discussion is a particular form of group interaction where members join together in addressing a question of common concern, exchanging and examining different views to form their answer, enhancing their knowledge or understanding, their appreciation or judgement, their decision, resolution or action over the matter at issue.

(Dillon, 1994, p. 8).

In recitation, exchanges are often between a teacher and one individual child at a time; discussions typically involve more participants who actively engage in sharing ideas, listening, and responding to others (Jacobs & Spangler, 2017). Productive mathematical discussions are thus discussions that lead to productive engagement with important mathematical ideas (Stein et al., 2008).

A third core term in our conceptual framework is that of talk moves. Research has identified types of statements that teachers typically make in discussions and how they function (Dillon, 1994). The core-practices literature in mathematics education highlights a particular list of conversational moves that teachers can make in classroom discussions (see table 1) – often referred to as talk moves (e.g. Kazemi & Hintz, 2014).

Talk moves are based on years of practice-based research – primarily in the United States – where teachers learn how to manage equitable and productive discussions (Chapin et al., 2009). These talk moves were identified as recurring moves that stimulated conversations towards reasoning, opened up conversations, helped students listen carefully to one another, and supported them as they built on and critiqued the ideas and arguments of their peers – thus leading to more productive discussions. Chapin et al. (2009) have identified talk moves that are effective for supporting, structuring, and leading mathematical classroom discussions (cf. Kazemi & Hintz, 2014), and these have been implemented and used in the professional development of teachers. Use of talk moves involves a shift in practice that teachers might never themselves have experienced in school, with new ways of participating in discussions that require new ways of interacting (O'Connor & Michaels, 2017).

Table 1. *A common list of talk moves with abbreviated explanations (Kazemi & Hintz, 2014, p. 21)*

Talk move	Example	Explanation
Revoicing	"So you're saying..."	Repeat what someone said and ask for verification
Repeating	"Can you repeat what she said in your own words?"	Ask someone to repeat or rephrase what someone else said
Reasoning	"Do you agree or disagree, and why?"	Ask to engage with others' ideas and reasoning
Adding on	"Would someone like to add on to this?"	Invite someone to participate or clarify their thinking
Wait time	"Take your time..."	Wait after having asked a question or called on someone
Turn-and-talk	"Turn and talk to your neighbor..."	Allow for orientation to others' thinking
Revise	"Would you like to revise your thinking?"	Allow someone to revise their thinking from new insights

Methods

To investigate how Norwegian kindergarten teachers consider talk moves and their potential use in kindergarten, we invited teachers from different kindergartens to participate in our study. To recruit participants, we used the network available through our work at the *Norwegian centre for mathematics education* (NCME). In particular, we searched among participants from earlier professional development projects that were concerned with mathematics in kindergarten. A network of 15 experienced kindergarten teachers from seven different kindergartens in the

same municipality accepted the invitation to participate. In the Norwegian context this implies that they are required to have a formal kindergarten teacher education (bachelor degree) or equivalent. Although this group is not representative of the population of Norwegian kindergarten teachers, we found that a network of kindergarten teachers who were already focused on discussing the quality of their kindergarten practice provided a useful space for exploring concerns that Norwegian kindergarten teachers might have with talk moves. We decided to observe their discussions of talk moves in two of their network meetings. Each meeting had a time span of one and a half to two hours.

The first author was responsible for data collection and took the role of an observer during the network's discussions. In the first meeting, the first author informed the participants about the aim of the study, how the data material was to be handled, and that they could withdraw at any time. Informed consent was retrieved from all participants. To increase the quality of the observations, and to ensure a non-participating observer role, we asked a colleague from NCME to give a short presentation of the talk moves to the network, to hand out supplemental materials (see table 1), lead the discussion, and ensure that all talk moves were addressed during the allocated time span. This colleague also answered practical questions, but was instructed to avoid interfering with the discussion and mostly stayed in the background. In the second meeting, the network participants managed the continued discussion of talk moves on their own, again with the first author as non-participating observer.

Since our focus was on how the kindergarten teachers considered talk moves and their potential application in kindergarten, and not on the details of their discourse, we decided to collect data through field notes with member checking – the latter to avoid observation bias. Moreover, to ensure credibility through triangulation, we also collected anonymous written notes that participants made on the material handed out. Inspired by previous research (e.g. Herbel-Eisenmann et al., 2013), where participants were asked to look at examples that illustrate characteristics of the type of language that we would expect teachers to use within a particular talk move in a school setting, we asked the participants to discuss the description of the seven talk moves that is commonly used in school contexts (see table 1). The description was translated and adapted into Norwegian by Wæge (2015).

In the first network meeting, the participants were presented with the matrix with the description and two blank columns for notes, and they were asked to discuss the talk moves freely. Each participant was encouraged to write down impressions, their own examples with benefits to the matrix, but also suggestions for additions, rewording

and clarification, and modifications, if any, regardless of whether they considered the examples or language to be recognizable or unfamiliar to the Norwegian kindergarten context. In addition they were encouraged to elaborate on their notes, for instance about perceived benefits or concerns. The purpose of the latter was to ensure that all participants had the opportunity to express their personal opinions, regardless of whether or not they presented their opinions in the plenary discussion. These notes were made anonymously on the matrix handed out and also collected and analyzed.

In the second meeting, the participants were presented with an adjusted version of the matrix handed out and commented on in the first meeting, where the suggestions and comments from the participants from the first meeting were included. As part of the member checking procedure, the first author also presented preliminary findings and asked for comments on these, whereupon the participants contributed enthusiastically with feedback and comments.

The analysis process was open and inductive, with organizing and open coding of the field notes and written responses in repeated readings. To obtain an overview of the participants' individual notes, we first grouped all comments regarding each talk move. The comments were then coded so that related comments were given the same color to improve our overview. Although comments could be about the same talk move, some comments could be approving (a smiley or "Yes!"), others could be more evaluative ("Yes, but ..."), while others could be dismissive ("No, we wouldn't use this"). We distinguished between such comments in our coding.

The field notes were written in situ during the participants' discussions. The first handling of the data was by the first author, and the continued coding, organizing and analysis was conducted by both authors and discussed in meetings together. First, the field notes were organized by the first author into sections according to the theme or talk move discussed. Second, the episodes within each section were discussed and coded to be further organized into smaller parts based on identified nuances. For instance, for the section of notes that were about recognition, we decided to distinguish between three units: a) the participants recognized the example they were presented, b) the participants both recognized and could provide an additional example from their own practice, and c) the participants recognized the example but used different wording. Another example of nuances that were rendered visible through this coding and organization involves sequences about the benefits and concerns of using talk moves. Both authors collaborated on the continued coding and organizing of the participants' rationales into smaller units

according to types of rationales. Through this organization we could distinguish between mathematical and social rationales underlying the benefits and concerns, and then each of these codes could be further divided according to individual considerations or group considerations. For instance, when the participants said they used the talk move *revoicing* to maintain the attention of the group, we coded this as recognition and use of a talk move based on group considerations, as a social benefit and rationale.

Our process of coding and organization of the codes presented us with a fine-grained break-down of the participants' considerations of talk moves. This part of the analysis process provided us with concepts and vocabulary to identify and describe different ways in which talk moves can be used in the Norwegian kindergarten context. Each author tried out different sorting of codes into main categories, before we agreed that the two main categories, *accord* and *discord*, best encompassed the participants' considerations of talk moves. The first main category, *accord*, identifies instances when the participating kindergarten teachers recognize particular talk moves they use or would use, based on provided examples. The second main category, *discord*, points to instances when the participants did not recognize a talk move in use, or when they believed that the talk moves were out of harmony with the Norwegian kindergarten tradition. For both categories we have included mathematical and social rationales that support their arguments and how these are based on individual or group considerations.

After we decided on the main categories, we also coded specific suggestions from the participants, depending on whether they were considered to be in accord or discord with the Norwegian kindergarten context. We distinguished between suggestions regarding descriptions of talk moves, information about usage, and conditions for usage.

Findings

In the following, we present results from our analysis, showing what aspects of talk moves kindergarten teachers considered to be in accord or discord with the Norwegian kindergarten culture and the rationales for their considerations. We then present an example that illustrates how kindergarten teachers' considerations can be adjusted and negotiated when challenged by experience.

Talk moves in accordance with the kindergarten culture

Our analysis found that the kindergarten teachers considered several talk moves to be in accord with the Norwegian kindergarten tradition.

For instance, the talk moves of *revoicing* and *repeating* appeared to be in accord with the participants' view of the Norwegian kindergarten culture. *Reasoning* and *adding on* also corresponded well, but the kindergarten teachers used other words to describe them. For instance, they suggested that kindergarten children are more likely to understand "say more" than "add on".

When the participants recognized a particular talk move and considered it to be in accordance with the Norwegian kindergarten culture, they were able to provide examples and descriptions from their own kindergarten context of the talk move in use. The participants either had authentic experiences of the talk move, or they could visualize themselves using it in an everyday setting in their kindergarten. The immediate recognition was linked to use during circle time, but in their discussion they gradually also referred to experiences in play, outdoor contexts, and everyday activities. In a school context, teachers often use talk moves to facilitate plenary discussions, but the kindergarten teachers in our study suggested that talk moves might also be relevant in conversations with one or two children, and they gave examples of such use. Moreover, the participants agreed that the described benefits from the matrix – both mathematical and social – were in accordance with the kindergarten context. They also added benefits they had experienced from their own practice, such as maintaining a common focus for the group of children, fair distribution of talk time, and creating room for the quieter children to talk in a larger group.

Talk moves in discord with the kindergarten culture

Although the kindergarten teachers considered several talk moves to be in accordance with the Norwegian kindergarten culture, they considered other talk moves to be in discord. *Waiting* is an example of a talk move that the participating kindergarten teachers considered to be in discord with the Norwegian kindergarten context. They explained that children often have to wait for various reasons during their day in kindergarten, and kindergarten teachers thus try to avoid asking children to wait. Another example is *revise*, which the kindergarten teachers considered to be too cognitively demanding for young children. Although they agreed that the proposed benefits of this talk move were important, they did not consider *revising* to be in accordance with kindergarten children's age and cognitive level.

When analyzing the participants' rationales for considering certain talk moves to be in discord with the Norwegian kindergarten context, we identified three patterns in the kindergarten teachers' arguments to be particularly interesting. One refers to *problematic choice of words*,

a second identifies problematic descriptions of *school-like settings*, and a third pattern points to a perceived lack of recognition for *non-verbal communication*. We elaborate on these below.

First, the kindergarten teachers identified questions of "why", prompts to "explain", and requests to "wait", which they found in the matrix, to be in disharmony with the Norwegian kindergarten context. For instance, they were worried about how children might feel when asked to justify when the words "why" and "explain" were used. Some participants argued that the talk moves that include such words are in discord with their views of the Norwegian kindergarten culture. They contend that children must be allowed to do and say things freely, and they were afraid that prompts to explain might limit the children's free expressions and make them insecure. They were also worried that this could have other unintended effects that could challenge the kindergartens' core obligation to ensure children's well-being.

Second, some descriptions of settings where the matrix suggested use of talk moves were considered to be too school-like by the participants, and hence perceived to be in discord with their own practice. From our analysis of the discussion, we found that this seemed to be triggered by such words and phrases as "sit", "turn and talk", "walk around and listen". The participants seemed to associate such words and phrases with traditional classroom and school settings, and this was considered to be in disharmony with the outdoor, playtime, and everyday life of most Norwegian kindergartens.

The third type of argument was related to the importance of non-verbal communication. The participants argued that non-verbal communication is particularly important in the kindergarten context, and that talk moves need to be attentive to gestures, tone of voice, and body language to be relevant in the kindergarten context. They were also concerned about how staff could recognize and acknowledge children's non-verbal communication when sharing their ideas and thoughts. They felt that this was not reflected in the description of talk moves, and they suggested that it should be included if talk moves were to be usable tools for mathematical discussions in the Norwegian kindergarten context.

An instance of considerations in movement

When a talk move was considered to be in discord with the kindergarten context, the participants could not come up with an example, or they believed there was a lack of harmony between the examples and the described benefits in the matrix and the kindergarten context. At one point, we observed how the kindergarten teachers' consideration was

challenged by their own experience, which led to negotiation and reconsideration. We observed this with respect to the talk move *turn and talk*, which was discussed in both network meetings. In the first meeting, the kindergarten teachers rejected this talk move because they imagined it used in a school-like setting, and said that they could not imagine using it in a kindergarten context. A shift then emerged in the second meeting, based on the story of one of the kindergarten teachers, "Nina" (pseudonym). She had been thinking about the talk move *turn and talk* between the two network meetings. After some consideration, she decided to try it out with a group of four children. At the second meeting, she told the other participants in the network about her positive experiences with *turn and talk*. She explained how this talk move had helped one of the quiet girls to participate in the discussion. This story seemed to move the discussion in a new direction, and the participants started discussing what constitutes a productive mathematical discussion. Examples of issues they discussed were: "Does the discussion have to be about explicit mathematics to be considered productive?" and "Is supporting children to listen to each other a prerequisite for a productive mathematical discussion?" In the first meeting, the participants had found it difficult to provide examples, descriptions, and benefits that were about explicit mathematical goals or content. The participants now recognized that they used some of the talk moves in conversations where the mathematical content was not so prominent. Through their discussion and negotiation of a common understanding, they agreed that social benefits are part of what constitutes a productive mathematical discussion. Nina's story, along with the ensuing discussion, prompted the group to regard several of the previously rejected talk moves as "worth trying out" (before possibly rejecting them later on).

Concluding discussion

Several studies investigate naturally occurring talk in the Norwegian kindergarten context, but calls have been made for further research that explores how kindergarten teachers can lead such discussions (Fosse, 2016). Talk moves might be a possible tool for this, but careful consideration is needed to avoid uncritical adoption of tools that were developed for use in a different context (cf. OECD, 2017). Our study aimed at contributing to such a careful consideration of possibilities and limitations for using talk moves in the Norwegian kindergarten context.

In our analysis, we identified several instances where participants considered talk moves to be in accordance with the Norwegian kindergarten culture, and several instances where they considered talk moves to be in

discord with the kindergarten culture. We also identified an instance where the kindergarten teachers' considerations were challenged. In our concluding discussion, we critically discuss these findings in order to better understand what these findings mean and what they might imply.

The kindergarten teachers who participated in our study considered some talk moves to be in accordance with the Norwegian kindergarten tradition. Examples were the talk moves of *revoicing* and *repeating*. With some modifications in language, the kindergarten teachers also appeared to consider *reasoning* and *adding on* to be in accordance with the Norwegian kindergarten tradition – as they had experienced it in their own work. This appears to correspond with previous research in the Norwegian kindergarten tradition. For instance, Carlsen (2013) identified questioning and revoicing as important in his study of naturally occurring talk in a Norwegian kindergarten. This might imply that some talk moves are already used in the Norwegian kindergarten context, but it also might imply that similar conversational moves are used without necessarily drawing upon the pedagogy of talk moves. For instance, Carlsen (2013) recognizes the use of revoicing when the kindergarten teacher in his study repeats and verifies the response of a child. In the pedagogy of talk moves, however, revoicing is used with the purpose of highlighting a child's thinking by revoicing it, and then asking the child to verify if this was indeed what they were thinking. When the teacher verifies, it indicates a more traditional recitation pattern in the communication. Therefore, recognition of certain conversational moves should not be considered superficially as evidence in favor of a pedagogy of talk moves.

Correspondingly, the kindergarten teachers who participated in our study considered several talk moves or descriptions of talk moves to be in discord with the Norwegian kindergarten tradition. Examples of this were the talk moves of *waiting* and *revising*. In order to make sense of the kindergarten teachers' considerations here, we need to carefully revisit their rationales for considering certain talk moves to be in discord with the kindergarten context. We identified three types of rationales, and we discuss each of these below.

A first rationale was related to problematic words or word use in the description of talk moves (see table 1). Pressing for reasoning by asking children to "explain", or by asking "why", are examples of words that kindergarten teachers found problematic. One interpretation of this is that reasoning itself is considered too challenging for kindergarten children. Another interpretation is that reasoning is considered appropriate, but the wording needs adjustment. Obviously, different levels of reasoning can be expected by one-year-olds and five-year-olds. Yet, the framework plan clearly states that the learning area of quantities, spaces and shapes

"involves asking questions, reasoning, argumentation and seeking solutions" (Norwegian Directorate for Education and Training, 2017, p. 53). It therefore seems viable to conclude that the wording might be the problem rather than the activity of reasoning. We agree with the kindergarten teachers that asking a small child to explain their thinking might seem harsh. However, the point of the matrix is not to prescribe an exact way of formulating each talk move, but rather to provide examples that can be adjusted. We therefore suggest that this rationale might be related to a misinterpretation of the matrix rather than a genuine problem.

A second rationale was related to descriptions of settings. For instance, the participants considered "sit", "turn and talk", and "walk around and listen" to be examples of school-like words and phrases. This corresponds with what Sæbbe and Pramling Samuelsson (2017) identified in their study of how Norwegian kindergarten teachers describe their own teaching practice. These authors suggest that kindergarten teachers' conceptions of schools and teaching practice in schools may be prejudicial and incorrect; teaching mathematics in school is not always about children sitting quietly at their desks. Although certain words and phrases might indeed warrant adjustment to work across age levels – in kindergarten as well as in school – we suggest that some of the kindergarten teachers' reasoning here might be based on conceptions of schools and school teaching that are not necessarily correct.

A third rationale related to a perceived lack of recognition for non-verbal communication. This is an interesting type of rationale that might require further investigation and development. Obviously, there are children in kindergarten who are too young to have a fully developed verbal language, and talk moves or productive discussions thus appear far-fetched. On the other hand, talk moves are verbal tools that teachers can use to facilitate productive discussions, but there is also a lot of non-verbal communication involved – both on the part of the teacher and the children who participate in a discussion. It is important to recognize the non-verbal moves that teachers can make in their work, as well as interpretation of the non-verbal communication of children or older participants in a discussion. Although this is not necessarily involved in a pedagogy of talk moves, it is indeed contained in the practice of leading discussions.

In addition to what has been discussed above, we also experienced some movement in the kindergarten teachers' considerations of talk moves through their discussions in the network. The story of Nina illustrates such movement, and it led other participants to broaden their understanding of what is involved in productive mathematical discussions and found the advantages of talk moves to include both social and

mathematical benefits. Another interpretation of the story of Nina is that it illustrates how teaching mathematics – and the pedagogy of talk moves in particular – is unnatural work that has to be learned (cf. Cohen, 2011). This story thus appears to support an argument that not only can talk moves be adjusted for productive use across settings, but talk moves are part of a practice of teaching that requires training. Analysis of results from our study seems to indicate that a pedagogy of talk moves is not yet part of kindergarten teachers' present teaching practice, but we have not been able to identify any critical arguments against integrating talk moves in a *professional* practice of teaching mathematics in kindergarten. However, doing so requires development of shared professional language and routines that are considered suitable for the Norwegian kindergarten context. Based on the results from this study, we suggest that such development is possible, and we also believe that it would be worthwhile.

Finally, we provide some reflections on our study and its limitations. Our research question might be interpreted as pointing toward generalization to a larger population. That is not our intent. Our intention has been to theorize from the empirical data, and discuss our findings in light of theory, previous research, and our own experience. In doing so, we present some credible candidate considerations of talk moves in the Norwegian kindergarten context that can be tested in future studies.

References

- Barnes, D. (1976). *From communication to curriculum*. Penguin Books.
- Breive, S. (2020). The materialisation of children's mathematical thinking through organisation of turn-taking in small group interactions in kindergarten. In M. Carlsen, I. Erfjord & P. S. Hundeland (Eds.), *Mathematics education in the early years: results from the POEM4 conference, 2018* (pp. 281–299). Springer Nature. doi: 10.1007/978-3-030-34776-5_17
- Carlsen, M. (2013). Engaging with mathematics in the kindergarten. Orchestrating a fairy tale through questioning and use of tools. *European Early Childhood Education Research Journal*, 21 (4), 502–513. doi: 10.1080/1350293X.2013.845439
- Cazden, C. B. (2001). *Classroom discourse: the language of teaching and learning*. Heinemann.
- Chapin, S. H., O'Connor, C. & Anderson, N. C. (2009). *Classroom discussions. Using math talk to help students learn*. Math Solutions.
- Cohen, D. K. (2011). *Teaching and its predicaments*. Harvard University Press.
- Dillon, J. T. (1994). *Using discussion in classrooms*. Open University Press.

- Dovigo, F. (2016). Argumentation in preschool: a common ground for collaborative learning in early childhood. *European Early Childhood Education Research Journal*, 24(6), 818–840.
doi: 10.1080/1350293X.2016.1239327
- Fosse, T. (2016). What characterises mathematical conversations in a Norwegian kindergarten? *Nordic Studies in Mathematics Education*, 21(4), 135–153.
- Gjems, L. & Løkken, G. (2011). *Barns læring om språk og gjennom språk: samtaler i barnehagen*. Cappelen Damm.
- Herbel-Eisenmann, B. A., Steele, M. D. & Cirillo, M. (2013). (Developing) Teacher discourse moves: a framework for professional development. *Mathematics Teacher Educator*, 1(2), 181–196.
doi: 10.5951/mathteaceduc.1.2.0181
- Jacobs, V. R. & Spangler, D. A. (2017). Research on core practices in K–12 mathematics teaching. In J. Cai (Ed.), *Compendium for research in mathematics education* (pp. 766–792). NCTM.
- Kazemi, E. & Hintz, A. (2014). *Intentional talk. How to structure and lead productive mathematical discussions*. Stenhouse.
- Mehan, H. (1979). *Learning lessons: social organization in the classroom*. Harvard University Press.
- Mercer, N. & Hodkinson, S. (2008). *Exploring talk in school*. Sage.
- Michaels, S. & O'Connor, C. (2015). Conceptualizing talk moves as tools: professional development approaches for academically productive discussions. In L. Resnick, C. Asterhan & S. Clarke (Eds.), *Socializing intelligence through academic talk and dialogue* (pp. 333–347). AERA.
- Norwegian Directorate for Education and Training (2017). *Framework plan for kindergartens – content and tasks*. Ministry of Education and Research.
<https://www.udir.no/globalassets/filer/barnehage/rammeplan/framework-plan-for-kindergartens2-2017.pdf>
- OECD (2017). *Starting strong V: transitions from early childhood education and care to primary education*. OECD.
- O'Connor, C. & Michaels S. (2017). Supporting teachers in taking up productive talk moves: the long road to professional learning at scale. *International Journal of Education Research*, 97, 166–175.
doi: 10.1016/j.ijer.2017.11.00
- Ryve, A. (2011). Discourse research in mathematics education: a critical evaluation of 108 journal articles. *Journal for Research in Mathematics Education*, 42(2), 167–199. doi: 10.5951/jresmetheduc.42.2.0167
- Schwab, J. J. (1954). Eros and education: a discussion of one aspect of discussion. *The Journal of General Education*, 8(1), 51–71.

- Stein, M. K., Engle, R. A., Smith, M. S. & Hughes, E. K. (2008). Orchestrating productive mathematical discussions: five practices for helping teachers move beyond show and tell. *Mathematical Thinking and Learning*, 10(4), 313–340. doi: 10.1080/10986060802229675
- Sæbø, P. E. (2019). *Barnehagelæreres "matematikkundervisning" i barnehagen* [Kindergarten teachers' "mathematics teaching" in kindergarten] (Ph.d. thesis). University of Stavanger. <https://hdl.handle.net/11250/2690289>
- Sæbø, P. E. & Pramling Samuelson, I. (2017). Hvordan underviser barnehagelærere? Eller gjør de ikke det i barnehagen? [How do kindergarten teachers teach? Or don't they do that in kindergarten?]. *Nordic Early Childhood Education Research Journal*, 14(7), 1–15. doi: 10.7577/nbf.1731
- Wæge, K. (2015). Samtaletrekk – redskap i matematiske diskusjoner [Talk moves – tools in mathematical discussions]. *Tangenten*, 2, 22–27.

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