



HAL
open science

Interactions between talk moves and other teaching moves

Kjersti Waege, Reidar Mosvold

► **To cite this version:**

Kjersti Waege, Reidar Mosvold. Interactions between talk moves and other teaching moves. Proceedings of the Fourteenth Congress of the European Society for Research in Mathematics Education (CERME14), Free University of Bozen-Bolzano; ERME, Feb 2025, Bozen-Bolzano, Italy. ⟨hal-05293280⟩

HAL Id: hal-05293280

<https://hal.science/hal-05293280v1>

Submitted on 1 Oct 2025

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.



Copyright - All rights reserved

Interactions between talk moves and other teaching moves

Kjersti Wæge¹ and Reidar Mosvold^{1,2}

¹Norwegian University of Science and Technology, Norwegian Center for Mathematics Education, Trondheim, Norway; kjersti.wage@ntnu.no

²University of Stavanger, Norway

This study explores the relationship between talk moves and the categories of teaching moves of exploring, encouraging and connecting to formal notation. Data from nine classroom co-enactment sessions in a professional development program aiming to support Norwegian teachers in learning ambitious mathematics teaching were analysed. We present a case from one of the co-enactments to unpack the teaching moves that the teachers used and the interaction between them. The findings reveal that the teacher used different categories of teaching moves simultaneously and in interaction and illustrate how the teaching moves of exploring and connecting to formal notation were made in ongoing interaction between talk moves, student talk and representing students' strategies. The findings also show how talk moves can be used within different categories of teaching moves.

Keywords: Teaching moves, talk moves, professional development, ambitious mathematics teaching.

Introduction

Leading discussions is often considered a core or high-leverage practice (e.g., Ball & Forzani, 2009; Jacobs & Spangler, 2017), and researchers have identified different groups of moves that teachers can make to stimulate discussion. Teaching moves can be defined on different levels, and with different goals (Jacobs & Spangler, 2017). In ambitious mathematics teaching, for instance, researchers have identified sets of talk moves (e.g., Chapin et al. 2009; Kazemi & Hintz, 2014), which are specific moves, often defined on an utterance level (Michaels & O'Connor, 2015). In another framework, Jacobs and Empson (2016) specified four high-level categories of moves that teachers can make when interacting with students to support their development of mathematical thinking: 1) *ensuring* that students make sense of the problem, 2) *exploring* details of students' thinking, 3) *encouraging* students to consider other strategies, and 4) *connecting* students' thinking with other representations. Based on analysis of data from the *Mastering Ambitious Mathematics teaching* (MAM) project, this study explores how these sets of teaching moves interact.

Theory

Talk moves have been used as a foundation for facilitating equitable and productive mathematical discussions (Kazemi & Hintz, 2014; Murata et al., 2017). Chapin et al. (2009) identified five talk moves that promote student thinking and participation: revoicing, repeating, reasoning, adding on, and wait time. Kazemi and Hintz (2014) added two more talk moves: turn and talk and revise thinking. Using talk moves productively in response to students' ideas and building on the diversity of students' thinking to guide their attention towards key mathematical ideas is challenging (Michaels & O'Conner, 2015). Murata et al. (2017) show how variations in use of talk moves might create different environments for students' learning and development of strategies. They suggest that "for talk moves to be used productively in mathematics classrooms teachers need to effectively break down,

represent, and discuss student strategies at an appropriate grain size while connecting with other strategies” (p. 312). In our study, we explore how talk moves are used in interaction with the more high-level categories of teaching moves identified by Jacobs and Empson (2016).

Jacobs and Empson (2016) present four major categories of teaching moves that promote student thinking. The first category involves ensuring that the students understand the problem, and this move is often used during the launching phase of a problem or early in the interaction with students. The second category involves exploring details of the students’ strategies, and highlights four subcategories: posing general starter questions to the students to initiate whole class discussions or conversations with students; pressing the students for an explanation of specific parts of their problem-solving processes by asking situation-specific questions to elicit the details of students’ thinking and thus make their explanations richer; linking the students’ representations and the story context; and expanding the students’ understanding. The third major category is about encouraging the students to consider other strategies and thus providing opportunities to compare different strategies and ways of reasoning. The fourth category emphasizes the importance of connecting students’ thinking to symbolic notations and involves representing students’ ideas in writing and making connections between their talk and representations (Jacobs & Empson, 2016). In this study we focus on the categories of exploring, encouraging and connecting.

Ambitious mathematics teaching highlights students’ emerging ideas and their mathematical sensemaking. The key principles include positioning students as sensemakers, providing equitable access to learning for all students, orienting students to each other’s thinking, and seeing teaching as both intellectual work and a craft (e.g., Kazemi, 2017; Lampert et al., 2013). Being responsive to students’ thinking and using their ideas in relation to mathematical goals is one of the most complex and challenging parts of ambitious mathematics teaching (Richards & Robertson, 2015). We explore how the teacher might use talk moves in interaction with different categories of teaching moves to facilitate equitable and productive discussions in mathematics.

Methods

We analyse data from a group of seven Norwegian elementary teachers, who participated in the MAM project, where they collaboratively engaged in cycles of enactment and investigation to learn ambitious mathematics teaching (Wæge & Fauskanger, 2021). The cycles included six phases: 1) preparation where teachers read literature; 2) collective analysis; 3) co-planning of the activity; 4) rehearsal of the activity where teachers act as students; 5) classroom co-enactment where one teacher teaches the activity with a group of students, and the other teachers observe; and 6) collective analysis (Wæge & Fauskanger, 2021). With our focus on teaching moves, we analysed data from the classroom co-enactment phase, where the teachers tried out instructional activities with a group of students.

We used *Sportscodel* video-analysis software for analysis, and this allowed us to code the video data directly instead of analysing transcripts. Data consist in video recordings from nine four-hour sessions, all of which include the six phases described above. In our coding, we identified segments of data that were distinguished by “conceptual breaks” (Jacobs & Empson, 2016). An example of such a conceptual break is when the teacher switch from launching the problem to posing a question

to explore students' thinking. This would constitute a conceptual break between two of the main categories in our codes. The size of the segments varied.

In our coding of the interactions that followed the launching of the problem, we used the following categories and codes from Jacobs and Empson's (2016) framework:

- Exploring details of students' thinking
 - Starter questions
 - Pressing for explanation
 - Linking students' representations
 - Expanding students' understanding
- Encouraging students to consider different strategies
 - Sharing other strategies
 - Making connections between other strategies
- Connecting strategies to formal notation
 - Representing students' strategies

In addition, we added talk moves and teacher questioning as codes in each of the main categories.

Findings

In what follows, we report on a close analysis of the teaching moves from one of the co-enactments with students to exemplify our analysis process and to present a case that unpacks the teaching moves and illustrates the interaction between talk moves and different categories of teaching moves. The episodes are from an enactment of a *quick image*. The learning goal for students was to learn about the distributive property of multiplication ($a \times (b + c) = a \times b + a \times c$). The teacher, Anna, showed the students a quick image for a few seconds and then asked the students how many dots they saw (see Figure 2). The first episode starts when Anna asks the students to share their thinking. Figure 1 shows the different teaching moves that Anna used in this episode. We see that Anna starts with *exploring* the students' strategies and *connecting* their strategies to formal notation. She then *encourages* the students to share other strategies, and this is followed by an *exploration* of several different strategies. Below, we analyse in more detail how the teacher engaged these different categories of teaching moves.

In the beginning of this episode, Anna is exploring details of students' thinking and we notice that there is an interaction between the teacher's use of *talk moves*, *representing* student ideas on the board, and *student talk*. We join the enactment as Anna asks the students a starter question about the number of dots (line 1), which is followed by *wait time* in which the teacher gives the students time to think before sharing their own ideas (line 2). One of the students, Lisa, then *shares her thinking* (line 4). Anna then begins to draw on the quick image on the board, pausing to check with Lisa about the accuracy of the drawing. She is using the talk move of *revoicing* to make sure that she and the students in the class understand Lisa's ideas: "So, you were thinking, first you saw that it was five and that it was four? And when you got to see the picture for the second time, you saw that there were three fives and three fours?", whilst simultaneously *representing* the strategy on the board (line 5) (see Figure 1).

	Time	Student talk	Exploring	Connecting to formal notation	Encouraging
1	00.57–01.06		Starter question		
2	01.06–01.25		Wait time		
3	01.25–01.26		Call student		
4	01.26–01.36	Student talk			
5	01.36–01.58		Revoice	Representing	
6	02.11–02.15			Representing	
7	02.15–02.23			Wait time	
8	02.20–02.25		Starter question		
9	02.25–02.30		Wait time		
10	02.30–02.32		Call student		
11	02.23–02.33	Student talk			
12	03.29–03.39			Representing	
13	03.39–03.42			Reasoning	
14	03.44–03.46			Call student	
15	03.46–03.52	Student talk			
16	03.52–03.59			Reasoning	
17	03.59–04.00			Call student	
18	04.00–04.10	Student talk			
19	04.10–04.12			Revoice	
20	04.12–04.15				Other strategies
21	04.15–04.16				Call student
22	04.16–04.21	Student talk			
23	04.21–04.32		Revoice	Representing	
24	04.32–04.45		Revoice	Representing	

Figure 1: Teacher’s use of teaching moves when sharing strategies

After representing Lisa’s strategy on the quick image, Anna asks the students to generate a numerical expression to connect with Lisa’s informal strategy and thus make connections between multiple representations (line 6). She gives the students a few seconds to think (*wait time*) (line 7), before she asks them if anyone will share their thinking (line 8). This is followed by another *wait time* (line 9). One of the students, Martin, *shares his thinking* (line 11), suggesting they can represent it as four times three and five times three. After having discussed with her colleagues what she might do, Anna *represents* what the student said on the board: $(5 \times 3) + (4 \times 3)$ (line 12). She then uses the talk move of *reasoning* to ask the students whether this number sentence represents Lisa’s strategy: “Is this (the numerical expression) the same as Lisa said?” (lines 13). One of students responds by saying “No, because you forgot the parentheses” (line 15). Anna agrees, and then she repeats the question (line 16). Another student responds by saying “yes” (line 18). Anna follows up his response by using the talk move of *revoicing*: So, you think it is the same? (line 19).

After *exploring* Lisa’s strategy, Anna is *encouraging* the students to share other strategies: “Did anyone think differently?” (line 20). She then *explores* the details of the other strategies (see Figure

1), and similarly to the exploration of the first strategy, we notice that there is an interaction between *talk moves*, *student talk*, and *representing* students' thinking on the board.

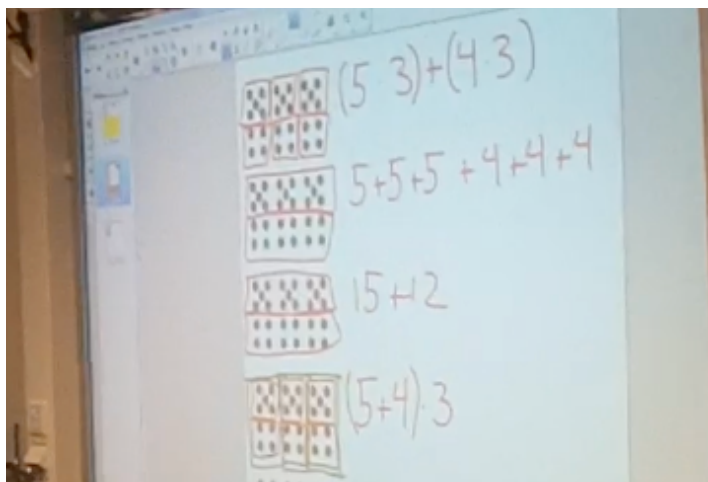


Figure 2: Student strategies for finding the number of dots

During this exploration, one of the students, Peter, presents a strategy that Anna and the other teachers had anticipated and wanted to highlight. He says that he added the five and the four, which equals nine, and then he multiplied nine by three (see Figure 2).

Later in the lesson, when the students had shared different strategies for finding the number of dots, Anna wanted the students to compare and make connections between two of the strategies: the one at the top, $(5 \times 3) + (4 \times 3)$, and the one at the bottom of the board, $(5 + 4) \times 3$ (see Figure 2).

The second episode starts when Anna asks the students if there is any connection between these two strategies. Figure 3 shows the different teaching moves that Anna used in this episode. We see that Anna *encourages* the students to make connections between strategies. She then *explores* the students' thinking about connections, before she *encourages* them to find more connections. Below, we analyse in detail how the teacher engaged these teaching moves.

In the beginning of this episode, Anna is *encouraging* the students to compare and make connections between the two strategies $(5 \times 3) + (4 \times 3)$ and $(5 + 4) \times 3$ and we notice that the teacher uses *talk moves* to give the students room to think and discuss possible connections. For instance, Anna starts with *asking about connections*: “Is there any connections between them (two strategies)?” (line 64). She then uses the talk move of *wait time* (line 65) before she asks them to *turn and talk* with their neighbour (line 65). Students then pair up and take turns explaining their thinking to a partner while the teacher (and observers) is listening and observing.

After the students have discussed their ideas with each other, Anne starts to *explore* their thinking, and we notice that there is an interaction between the teacher's use of *talk moves*, *student talk*, and the teacher *pressing* for explanations or justifications. Anna asks the students a *starter question*: “Is there anyone that would like to share what you talked about?” (line 67). Two of the students, Maria and Eli, *share their ideas*, explaining that the numbers are the same in the two numerical expressions, but that there are two threes in the top one, while there are only one three in the lower one (line 69). Anna then *presses* the students to explain why (line 71) and gives them a few seconds to think (*wait*

time) (line 71). The same two students, Maria and Eli, *follow up* her question by saying that on the top one there is five times three and four times three, and on the bottom one there is five plus four times three (line 73). Anna continues to *press* for more explanations and asks the students to discuss why we get the same answer for both strategies (line 74) and she then uses the talk move of *turn and talk* (line 75). One of the students, Tom, *gives an explanation* that is similar to what Anna and Eli said, emphasizing that the four and the five are added together in the one at the bottom (line 77). Anna summarises what the students have said (line 78). She then *encourages* them to find other connections: “Do you see other connections?” (line 79) and uses the talk move of *wait time* (line 80).

	Time	Student talk	Exploring	Connecting to formal notation	Encouraging
64	10.05–10.35				Make connections
65	10.35–10.45				Wait time
66	10.45–11.40				Turn and talk
67	11.40–11.46		Starter question		
68	11.46–11.48		Call student		
69	11.48–12.03	Student talk			
70	12.03–12.07		Pressing		
71	12.07–12.14		Wait time		
72	12.14–12.16		Call student		
73	12.16–12–26	Student talk			
74	13.12–13.14		Pressing		
75	13.14–13.58		Turn and talk		
76	14.18–14.23		Call student		
77	14.23–14.45	Student talk			
78	14.45–15.04		Revoice		
79	15.04–15.06				Make connections
80	15.06–15.23				Wait time
81	15.23–15.30		Repeating		
82	15.30–15.33		Call student		
83	15.33–15.50	Student talk			
84	15.50–16.00		Revoice		

Figure 3: Teacher’s use of teaching moves when connecting strategies

However, after having conferred with her colleagues, Anna goes back to Tom’s explanation and asks the students if they can *repeat* what Tom said (line 81). One of the students, Heidi, then try to repeat what Tom said in her own words (line 83), and Anna uses the talk move of *revoicing* to make sure that she and the students understand his explanation (line 84).

Concluding discussion

From our analyses, we make two observations about categories of teacher moves and use of talk moves. First, we observe that there tends to be interactions between different categories of teaching moves. Although identifying individual teaching moves can be useful for research and education of teachers (Jacobs & Empson, 2016; Jacobs & Spangler, 2017), our analyses illustrate how teaching moves are not made in isolation but are used in ongoing strings of interaction. This corresponds with

how Cohen et al. (2003) describe teaching as interactions between teacher and students around some content. Although the discussion in the first example primarily aimed at exploring students' thinking, we saw how the teaching moves of exploring and connecting to formal notation were made in ongoing interactions between the teacher's use of talk moves, student talk, and representing students' strategies on the board. For instance, we saw how the teacher responded to the students' contributions by using the talk move of revoicing, in which she repeated what the student said and asked the student to verify if her revoicing was correct whilst simultaneously representing the strategy on the board. She stopped frequently to confirm with the students that she was representing their thinking accurately. Thus, the teacher used the two categories of teaching moves – exploring students' thinking and connecting it to formal notation – simultaneously and in interaction. We saw how the teacher never left the students as she revoiced and represented their ideas and asked them questions that allowed them to elaborate on their own strategies. With this approach, ownership of ideas remained with the students. This corresponds with how Murata et al. (2017) describe the dialogue as bouncing between the teacher and the students throughout the explanations, where the teacher breaks down and represents students' strategies at appropriate grain size. The second example, which was a sequence where the teacher aimed at encouraging students to make connections, illustrates the interaction between the teacher's use of talk moves, student talk, and the teacher pressing for explanations or justifications to highlight key mathematical ideas. We saw, for instance, how the teacher asked students to turn and talk after having pressed them to provide an explanation of a specific connection. Thus, she gave students space to explain and discuss their thinking.

Second, our analyses illustrate how talk moves can be used in different categories of teaching moves. For instance, the first episode illustrates how the teacher used the talk move of wait time when exploring the details of students' thinking. After having posed starter questions to invite students to share their thinking, she used the talk move of wait time to give students space to think and make sense of the questions. In the second episode we also observe how the teacher used specific talk moves within the category of encouraging students to compare and make connections between strategies. For instance, after the teacher posed a question about connections between specific strategies, she used wait time followed by turn and talk. Thus, she provided the students with space to make sense of it and to explain their thinking. By giving students time and space to engage with each other's ideas, she provided them with opportunities to connect their emergent ideas with learning goals and key mathematical ideas (Murata et al., 2017). We agree with Jacobs and Spangler (2017) that the promise of teaching moves hinges on their enactment, the learning goal, and the context in which they are enacted, and our analyses illustrate how the use of specific talk moves to enact the more overarching categories of teaching moves also depends on the context and the learning goal.

This study is limited by the scope of the episodes analysed. Yet, our study provides an existence proof that teaching moves are carried out in ongoing interactions, and that talk moves can be used to enact different categories of teaching moves – depending on the learning goal and the instructional context. Further research should be made to explore if there are other patterns of interactions among overarching and specific teaching moves, and if similar patterns can be found also in the move of ensuring that students make sense of the problem.

References

- Ball, D. L., & Forzani, F. M. (2009). The Work of Teaching and the Challenge for Teacher Education. *Journal of Teacher Education, 60*(5), 497–511. <https://doi.org/10.1177/0022487109348479>
- Chapin, S. H., O'Connor, C., & Anderson, N. C. (2009). *Classroom discussions. Using math talk to help students learn*. Math Solutions.
- Cohen, D. K., Raudenbush, S. W., & Ball, D. L. (2003). Resources, instruction, and research. *Educational Evaluation and Policy Analysis, 25*(2), 119–142. <https://doi.org/10.3102/01623737025002119>
- Jacobs, V. R., & Empson, S. B. (2016). Responding to children's mathematical thinking in the moment: an emergent framework of teaching moves. *ZDM Mathematics Education, 48*, 185–197. <https://doi.org/10.1007/s11858-015-0717-0>
- 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). National Council of Teachers of Mathematics.
- Kazemi, E. (2017). Teaching a mathematics methods course: Understanding learning from a situative perspective. In S. Kastberg, A. Tyminski, A. Lischka, & W. Sanchez (Eds.), *Building support for scholarly practices in mathematics methods* (pp. 49–65). Information Age.
- Kazemi, E., & Hintz, A. (2014). *Intentional talk. How to structure and lead productive mathematical discussion*. Stenhouse Publishers.
- Lampert, M., Franke, M. L., Kazemi, E., Ghouseini, H., Turrou, A. C., Beasley, H., Cunard, A., & Crowe, K. (2013). Keeping it complex: Using rehearsals to support novice teacher learning of ambitious teaching. *Journal of Teacher Education, 64*(3), 226–243. <https://doi.org/10.1177/0022487112473837>
- Michaels, S., & O'Connor, C. (2015). Conceptualizing talk moves as tools: Professional development approaches for academically productive discussion. In L. B. Resnick, C. A. Asterhan, & S. N. Clarke (Eds.), *Socializing intelligence through talk and dialogue* (pp. 347–362). American Educational Research Association.
- Murata, A., Siker, J., Kang, B., Baldinger, E. M., Kim, H. J., Scott, M., & Lanouette, K. (2017). Math Talk and Student Strategy Trajectories: The Case of Two First Grade Classrooms. *Cognition and Instruction, 35*(4), 290–316. <https://doi.org/10.1080/07370008.2017.1362408>
- Richards, J., & Robertson, A. D. (2015). A review of the research on responsive teaching in science and mathematics. In A. D. Robertson, R. E. Sherr, & D. Hammer (Eds.), *Responsive Teaching in Science and Mathematics* (pp. 36–55). Routledge.
- Wæge, K., & Fauskanger, J. (2021). Teacher time outs in rehearsals: in-service teachers learning ambitious mathematics teaching practices. *Journal of Mathematics Teacher Education, 24*, 563–586. <https://doi.org/10.1007/s10857-020-09474-0>