NTNU – Trondheim
Norwegian University of
Science and Technology

Video as a Tool in Prospective Mathematics Teachers' Professional development

Torunn Klemp, Vivi Nilssen, Siri-Malén Høynes

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LaUDiM – an intervention project

Explore and develop student teachers' orchestrating of mathematical whole class discussions using video recordings as a tool.

The reason for the intervention

Productive mathematical discussion:

Discussion where the pupils can reason in mathematics and develop a deep understanding for mathematical concepts.

- To listen to and interpret pupils mathematical ideas is demanding
  (Chamberlin, 2005)
- To stimulated pupils thinking by asking questions is a complex skill which demands good planning
  (Manoucheri & Lapp, 2003)
- Student teachers ask few follow-up questions and give the pupils little time for explaining their answers
  (Henning & Lockhart, 2003)
- Student teachers have difficulties responding to unexpected responses from the pupils
  (Nilssen, 1995)

The intervention

Planning session
With two mentors

Mathematical discussions in the classroom

Video supported post-lesson mentoring session

Research question

How can video recordings facilitate identification of qualities and challenges in student teachers' mathematical discussions with pupils?

Why video as a learning tool?

- Joint video analysis/discussions develop teachers' ability to focus on the pupils' thinking and learning

  (Coles, 2013; Sherin, 2004)

- When discussions are based on video recording teachers tend to talk in a more focused, deepened and analytic way about teaching and learning

  (Borko et al., 2008; Coles, 2013).

- Video sessions give teachers time and new opportunities to notice and explore patterns of interaction in mathematical dialogues

  (Sherin & van Es, 2005).

Data material

- Transcribed video recordings from 4 mathematical discussions between one of the student teachers and a class of third graders
- Transcribed video recordings from pre- and post-lesson mentoring sessions where the mathematical discussions were the topic. Participants here: four student teachers and two mentors (one teacher and one mathematics teacher educator)
- Logs written daily by 4 student teachers during the five weeks of student teaching.
- Notes written by observing researchers from pre- and post-lesson mentoring sessions.

Analysis

Inductive analysis inspired by the constant comparative method (Strauss & Corbin, 1998)

Tools in the analysis:

- Questions
- Comparisons
- Tables

- Sequenced the classroom discussions.
- Coded the dialogues with single or pairs of pupils by open coding.
- Identified and compared challenges across all dialogues concerning time to think, follow-up questions and interpretation of pupils responses.
- Analysed the video-based post-lesson mentoring sessions based on when the video was stopped and what the topic in the discussion was.
- Compared findings in the classroom discussions with utterances in pre- and post-lesson mentoring sessions and the logs.
  - Experiences with mathematical discussions
  - Use of video
- Compared findings from the post-lesson mentoring sessions with utterances about video as a mediating tool in the students logs.

Findings

The analysis shows that both the student teachers and the mentors identified interpreting and representing the pupils thinking as a key challenges.

There were 3 interrelated categories:

- Predict
- Choose
- Represent

Excerpts from Catherine's log:

«It was so difficult to interpret the pupils' utterances and to decide how to respond based on that interpretation. Some answers comprised elements which I hadn't considered. It was difficult to respond offhand.»

«When I stood there, in the classroom, I remember thinking: 'How on earth can I elucidate this pupil's idea?'»

Catherine's dialogue with Sarah about 36 + 40

C: 36 plus 40 (writes 36+40 on the smart board). Now I will give you time to think.

C: Sarah, would you like to tell us what you found out?

S: Eh…. That it makes 76.

C: That it makes 76. Tell me how you figured that out? How did you make 76 out of these numbers?

S: Because I added together the tens first and then I added the ones.

C: So, you added the tens first. How many tens do we have in this task? (Points at 3 in 36).

S: 70, I mean 7.

C: What did you say?

S: Or 3.

C: Three tens. And here (points at 4 in 40)?

S: 4.

C: Four tens (writes =). And then you found that it makes….?

S: 70

(Pupils in the back:: «no, 76»)

C: 70 (writes 7 on the board). And where did you get the number 6?

S: From 36.

C: From 36, so, from this number? (Points at 36)

S: Yes.

C: (Writes 6 behind 7 at the board)

Written on the board:

36 + 40 = 76

Quotes from the post mentoring session

UM (stops the video): Do you hear what Sarah explains? Added the tens first and then added the ones - is that what she says?

(confirming nods)

UM: Now, if we think about PSM's concern, how can we ensure that the other pupils also get the strategies – and how we can help them so they don't fall off? (…) Should we write down more of what the children say? Now when you hear what Sarah says, how could we represent what Sarah says - added the tens first and then the ones?

C: I don't know if it is too trivial that there are three tens in 36? If it is a little bit difficult a possibility could be to look at how many tens there are in each number and how many ones there are in each number, and write down that as a new arithmetic problem.

UM: How do you think that arithmetic problem would look like? (…) How to represent that?

C: It is possible to use a number line, but that is not what she did. She pulled out the tens from the numbers (…), found how many tens there are in 36, and how many there are in 40. OK, how many [tens] do we have in all? And how many ones are there?

UM: We could have split 36 into three tens and six ones, 30 and 6.

(…)

C: How could I have written that without to much scribbling?

UM: Others, have any of you thought about that?

Lisa: May be 10 + 10 + 10 + 10 + 10 +10 + 10 + 6 ?

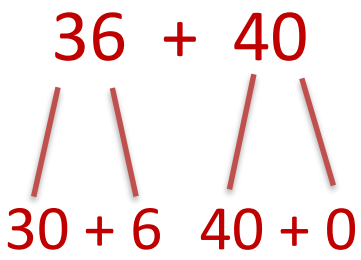
Ann: May be it is possible to write = 30 + 40 + 6. If so, they will see very clearly that she says three tens and that equals 30. But without concretes that might [still] be vague to them?

UM: I think that the splitting into three tens and six ones is important here.

How to represent

“Because I added together the tens first and then I added the ones.”

Mentor from the university:



Mentor from the primary school:

«Then, I would, as Ann said, have added $= 30 + 40 + 6$

Then you may be could remove this (holds her hand over 30+6 and 40+0). Afterwards, wiped it out, and only left this

[36 + 40 = 30 + 40 + 6] which shows what we have done.

Because the splitting is important for those who doesn’t have full control.»

Focus in the mentoring session

- It can be difficult for the pupils to explain their ideas. The teacher must be the pupils' interpreter and translate to the other pupils.

- The teacher must represent the idea in a way that the pupil recognizes – and thereby confirm the pupils' thinking.

- To represent the pupils' thinking in the whole class discussion in a way that can develop the other pupils' understanding the teacher needs to be able to select which strategies to present, in which order and how to represent it.

Shared knowledge in the mentoring discussion:
«We should leave something on the board representing what the children tell.»

Video as a tool… excerpts from logs

«The video made the mentoring effective and very instructive. We could easily go into a situation and be specific. Looking at the video we had a common point of departure for our discussion. We were able to discuss specific utterances from the pupils in a way that would have been impossible if we had to rely on what remembered. In that way the video also made it easier to talk about alternative use of the blackboard.»

«In posterity when we saw the video, we were able to listen to the pupil's words ones more and decide which representations that would fit in the actual situation.»

«The pupils' thoughts and how I handled them came into focus. In other words, the video helped us approaching emerging problems without becoming personal.»

«It is easier to hear whether my utterances are understandable and good, or not.»

Links to ‘Contingency’ ?

Knowledge-in-*inter*action as revealed by the ability of the teacher to ‘think on her feet’ and respond appropriately to the contributions made by her students during a teaching episode.

- Responding to children’s ideas
- Use of opportunities
- Deviation from agenda

(Rowland, Huckstep & Thwaites, 2005).