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Developing preservice teachers' noticing and pedagogical reasoning in video-based reflection conversations

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Abstract: Learning to enact ambitious teaching is challenging because of the improvisational skills needed, and the reliance on professional judgment that governs the decision-making in service of many and often conflicting purposes. Research has therefore drawn attention towards PSTs' ability to notice and reason about critical moments in teaching and learning because it captures the teachers' decision-making process when they face novel problems, or pedagogical dilemmas which arise in the moment during teaching. This ethnomethodological case study examines a reflection conversation between three preservice teachers (PSTs) and their practicum teacher and campus teacher educators about three video-recorded 'golden moments' chosen by the PSTs from their enactment of a pre-designed instructional activity. We ask the following research question: How do preservice teachers develop their ability to notice and reason about ambitious teaching practices through a video-based reflection conversation? The analysis shows that the PSTs' initial noticing and pedagogical reasoning do not fully grasp the complexity and possible different instructional purposes in the teaching situations. Through the reflection conversation three pedagogical dilemmas are elevated, and the PSTs are given the opportunity to engage in a discussion about the pedagogical dilemmas and how different pedagogical actions might support different purposes. Their pedagogical reasoning becomes more elaborate, and we find signs that the PSTs increasingly discuss and develop their pedagogical judgment in the direction of ambitious teaching practices.

Keywords: teacher noticing, pedagogical reasoning, video-based reflection conversations, practice-based teacher education

Samandrag: Å læra å undervisa ambisiøst er ei utfordring på grunn av dei improvisatoriske evnene som trengst, og fordi slik undervisning er avhengig av ei profesjonell dømmekraft som styrer avgjerdsprosessen der læraren må balansera mange ulike føremål. Forsking har difor retta merksemd mot lærarstudentars evne til å leggja merke til og resonnera kring avgjerande augneblinkar i undervisning og læring fordi det fangar den avgjerdsprosessen som læraren må gjera når dei møter nye utfordringar, eller dilemma som oppstår der og då. Denne etnometodologiske kasusstudien undersøkjer ein refleksjonssamtale mellom tre grunnskulelærarstudentar, og deira praksis- og campuslærarar rundt tre videofilma «gylne augneblikk» som studentane har valt ut frå praksis, der dei gjennomførte ein førehandsdesigna undervisningsaktivitet. Me stiller følgjande forskingsspørsmål: Korleis utviklar lærarstudentar evna til å leggja merke til og resonnera kring ambisiøse undervisningspraksisar gjennom ein videobasert refleksjonssamtale? Analysen viser at det studentane frå først av har lagt merke til og den pedagogiske resonneringa deira ikkje får fram kompleksiteten i undervisningssituasjonane og avgjerdsprosessane læraren står i. Gjennom refleksjonssamtalen blir tre pedagogiske dilemma løfta fram, og lærarstudentane får sjansen til å engasjera seg i ein diskusjon om dei tre pedagogiske dilemmaa og korleis ulike pedagogiske handlingar kan støtta ulike føremål. Dei pedagogiske resonnementa blir meir utbygde, og me finn teikn til at studentane i aukande grad diskuterer og utviklar den pedagogiske dømmekrafta si i retning av ambisiøs undervisning.

Nøkkelord: fokusert observasjon, pedagogiske resonnement, videobaserte refleksjonssamtalar, øvingsbasert lærarutdanning

This article presents an analysis of a reflection conversation between preservice teachers (PSTs), practicum teachers, and campus teacher educators in the subject mathematics. The focus is on the PSTs' ability to *notice* (van Es et al., 2017) and *reason* about (Horn, 2020) ambitious practices in mathematics teaching (Lampert et al., 2010) in the context of a practice-based teacher education project called ReTPro (Rehearsing Teaching Professionally). ReTPro is a design-based research project funded by the Norwegian Research Council that follows a strand of research taking a situative view of teacher learning and sees enacting and analysing teaching as core elements for learning to teach (e.g. Grossman et al., 2009; McDonald et al., 2013).

We ask the following research question: How do preservice teachers develop their ability to notice and reason about ambitious teaching practices through a video-based reflection conversation?

ReTPro aims to improve teacher education by drawing on a four-phase rehearsing cycle at both university and practicum schools, focusing on: (1) studying and modelling, (2) repetitive try-outs and simulations, (3) enactments at the practicum schools, and (4) analysis and reflections on the enactments (McDonald et al., 2013). The overall aim is to develop an improvisational teaching repertoire, including dialogic teaching (Alexander, 2020).

Ambitious teaching practices

The basic pedagogical foundation in dialogic teaching is known under different labels in research on mathematics education, such as ambitious mathematics instruction (Lampert et al., 2013; van Es et al., 2017) and responsive mathematics teaching (Horn, 2020). This research places student work at the centre of activity to support high-level participation, value the knowledge and resources all students bring to the classroom, and aims to maintain academic rigour.

Such ambitious teaching is challenging work for teachers because it requires a nuanced understanding of how to facilitate students' thinking and learning through dialogue, and why this is important. Jacobs and Spangler

(2017, p. 768) highlight two specific teaching practices as core to the interactive part of such ambitious instruction in which students' thinking is central: teacher noticing and leading discussions. They argue that research on both teacher noticing and leading discussions captures the challenging in-the-moment work of teachers.

Teacher noticing grasps the processes of attending to noteworthy features of instruction, such as what students are thinking and doing, and deciding how to respond effectively (van Es et al., 2017). Leading discussions captures the in-the-moment work of supporting students while they explain their thinking and make sense of and critique the reasoning of others (Jacobs & Spangler, 2017, p. 768).

Previous studies report that PSTs' ability to notice what is important in instruction is underdeveloped (Jacobs et al., 2010). PSTs are more focused on classroom management and teachers' actions than students' thinking (Stockero et al., 2017). Consequently, when a PST encounters, for example, an unexpected or incomplete mathematical contribution from a student, she will unlikely attend to and interpret it as a 'golden opportunity… they can use for moving students toward more sophisticated and mathematically grounded understanding' (Walshaw & Anthony, 2008, p. 539). More predictably, she will be limited by her previous experiences and not interpret the moment as noteworthy (van Es et al., 2017).

Consequently, van Es et al. (2017) call for research that not only explores the nature and substance of PSTs' noticing, but also the learning environment designed to create opportunities for PSTs to develop new ways of attending to and making sense of ambitious instruction.

Preparing for ambitious teaching

In teacher education, there is an ever-ongoing discussion about how to prepare PSTs for ambitious and dialogic teaching, and what can or cannot be taught and rehearsed. Scholars (e.g. Grossman et al., 2009) suggest that teacher education works on what they call core practices of teaching, such as leading discussions (Lampert et al., 2013), and teacher noticing (Jacobs & Spangler,

2017). Grossman et al. (2009) argue that when PSTs engage in these practices, they develop professional knowledge and skills, as well as an emerging professional identity.

Core practices may therefore offer teacher educators powerful tools for preparing PSTs for the interactive and challenging work of ambitious teaching, because they highlight specific, routine aspects of teaching that demand professional judgment, and the creation of meaningful intellectual and social communities for PSTs, teacher educators, and practicum teachers (McDonald et al., 2013, p. 378).

Grosser-Clarkson and Neel (2020) point out that designing and implementing appropriate learning experiences for PSTs is complex and nuanced work. One approach a teacher educator can use is a set of carefully predesigned instructional activities (McDonald et al., 2013). These often come with a protocol that guides how the teacher and students can interact, how materials can be used, and provide examples of questions and talk moves the PSTs can use in their attempts to enact the relational and improvisational work that ambitious teaching requires. This contrasts with a more open-designed approach, where the PSTs design their own activities to enact the targeted core practices (Grosser-Clarkson & Neel, 2020).

Kavanagh et al. (2020) found that constraining PSTs' choices in activities and content can help focus attention on targeted teaching practices. There have, however, been concerns that such approaches can become too procedural and not taught in connection to instructional purposes and principles.

Kennedy (2016), for example, argues that when teaching is defined only by its visible teaching aspects without attending to the underlying teaching decisions and professional judgments, PSTs are likely to use the offered techniques at 'the wrong times, in the wrong places, or for the wrong reason' (p. 9). Horn (2020, p. 326) reminds us that successful teaching cannot be evaluated by faithful execution of some idealised pedagogical actions from a template. She stresses that even though a teacher strives towards ambitious goals, multifaceted and complex classrooms do not support ideal types of pedagogical action, because the practice needs to be adapted to make sense for specific students in a specific context.

Consequently, teacher educators should keep in mind that professional judgment and pedagogical reasoning need to be a central part of practice-based approaches.

Videos have been shown to be a powerful tool to enhance teacher noticing (van Es et al., 2017), and to discuss and develop pedagogical reasoning and judgement (Horn, 2020). Jenset et al. (2024) found that video-based discussions of PSTs' own teaching can enhance their attention towards pedagogical dilemmas they encounter during in-the-moment decision-making situations.

In this study, we therefore address Kennedy and Horn's concerns by examining how pedagogical reasoning can become explicit and visible in video-based reflection conversations in which the PSTs are provided opportunities to engage collectively in noticing and reasoning, using their own videos as representations of practice (Grossman et al., 2009). The practicum and campus teachers engage in the video-based reflection conversation with the PSTs to contribute to the development of the PSTs' abilities to notice, discuss, analyse, and generalise from their teaching experiences in leading discussions.

Pedagogical dilemmas

Lampert et al. (2010) point out that ambitious teaching is an improvisational practice, contingent on the ideas and contributions in the situative practice in the classroom. One way of looking at this complexity is to see teaching as a problem-solving activity, where the teacher constantly faces novel problems, or dilemmas, which arise in the moment during teaching (Lampert, 2001).

Lampert (1985) coined these problems *pedagogical dilemmas*, which have multiple viable and often contradictory solutions that sometimes require reasoned arguments with oneself. In teaching, these dilemmas need to be acted upon there and then. Often, there are no clear right or wrong responses, just different paths that will determine the direction of the classroom activity or discussion.

Teaching is therefore seen as the act of constantly choosing between alternative courses of action that will create new dilemmas. This cyclical routine activity of attending to, interpreting, and responding to situations in the classroom is foundational for ambitious teachers' in-the-moment decision-making (van Es et al., 2017).

Kavanagh, Metz et al. (2020) argue that to navigate in this terrain, teachers need to rely on their pedagogical judgement to make decisions that are productive to students' learning. This act of drawing on one's professional judgement and knowledge to determine an appropriate response to a pedagogical dilemma in pursuit of particular pedagogical goals or purposes is, by Gotwalt (2023, p. 2), termed *pedagogical reasoning*.

Pedagogical reasoning

Horn (2020) argues that pedagogical judgement is critical for teacher education and offers a tripartite conception that comprises *pedagogical action* supported by *pedagogical reasoning* and rooted in *pedagogical responsibilities*. Pedagogical actions refer to the choices the teacher makes, intended or not. Horn makes the point that the same pedagogical action might have different interpretations and rationales. So, in the absence of one solution to a dilemma, the teacher's pedagogical judgement is an iterative process between action and reasoning, which are both connected to, and contextualised in, pedagogical responsibilities.

Consequently, teachers engage with their sense of institutional obligations, and pedagogical and ethical commitments, in their decision-making (Horn, 2020, p. 325). For example, when an ambitious teacher encounters the same unexpected or incomplete mathematical contribution from a student, she will most likely notice the moment as a golden opportunity. Still, she might decide not to act on it there and then, because her decision is rooted in another pedagogical obligation, such as time constraints.

For a teacher educator, it is challenging to explain and teach such pedagogical judgement to PSTs. Kavanagh et al. (2020) have studied how teacher educators in practice-based teacher education programmes do this, and find that six practices stand out as suitable for supporting novices to engage in pedagogical reasoning: creating a shared instructional context, posing pedagogical dilemmas, highlighting instructional purposes, engaging relevant knowledges, considering multiple instructional decisions, and making instructional decision-making explicit.

Methods

This is a qualitative, ethnomethodological study (Francis & Hester, 2004). The authors of this article are both teacher educators and researchers from the teacher education programme where ReTPro is developed and conducted. As researchers, we are thus influenced by our own teaching and research experiences, as well as theoretical understandings. Acknowledging that all knowledge is partial, situated, and contextual (Braun & Clarke, 2013, 2022; Francis & Hester, 2004), we will explain in detail our procedures for data collection, selection, and analysis.

Data collection

In the ReTPro project, a class of 14 PSTs in the primary school teacher education were participants from the start of their education. In their second semester, they started a two-semester course in mathematics, which included four rehearsing cycles, two in each semester. The PSTs were divided into five practicum groups. Three groups completed all tasks, but to keep the data manageable with the degree of detailed analysis we wished to do, we picked out one reflection conversation from the fourth, and final, rehearsing cycle. Participants in the case conversation are campus teacher educators Carla and Celine, practicum teacher Petra, and the PSTs Susan, Simon, and Sally. They had had their practicum in a first-grade class.

The fourth rehearsing cycle was completed in late autumn 2022 and consisted of a pre-designed 'three-act-task activity' (Lomax et al., 2017) – a mathematical modelling task in the following called 3ACT. This activity is designed to create opportunities for PSTs to practise how to facilitate students' thinking and understanding through dialogue. The activity is structured around 3 'acts'. In act 1, the teacher shows an intriguing short video of an interesting real-world situation. Then, the teacher invites the students to wonder and pose questions. In the protocol, the PSTs are encouraged to invite all students to report on what they notice and wonder about to pique their interest and help them make sense of the situation. Furthermore, all questions

and ideas are suggested recorded on the board to make them accessible to young learners and to treat all students as sense-makers, which are central principles in ambitious teaching (Lampert et al., 2013). Towards the end of act 1, the PST is encouraged to guide the students towards questions that are mathematical and agree on one question to be explored further. In act 2, the students gather information and develop mathematical models to solve the chosen problem. In act 3, the PST leads a classroom discussion using the students' ideas, connecting them to mathematical ideas, and evaluating the mathematical models against the real-life situation in act 1.

In our case, the teacher educator first modelled a 3ACT in phase 1. The teacher educator paused during the modelling to connect suggested pedagogical actions in the protocol to ambitious instructional purposes, for example, the reason why it is important to record all student questions on the board. Then, each PST prepared for and rehearsed a 3ACT on campus, with the other PSTs acting as students. The group of PSTs then prepared and enacted a 3ACT in their practicum classrooms, with one PST leading the activity, the others assisting, observing, and video filming.

The PSTs were then asked to study their video and pick video-clips of what we called 'golden moments used or lost' to embrace successes and failures in their attempts to be responsive to students' contributions in the enactment, and to provide opportunities to engage in pedagogical reasoning in retrospect. Golden moments were described as classroom situations with a potential to develop students' mathematical understanding, in the literature review referred to as 'golden opportunities' (Walshaw & Anthony, 2008). These labels are partly overlapping with what is also known as 'teachable moments' or 'critical moments' (see in this anthology Cabot & Brodal, 2025, as well as Kulild et al., 2025). The chosen video-clips were the starting point for the video-based reflection conversation, which lasted 1 hour and 8 minutes and was carried out and video recorded on Zoom.

The PSTs had all signed informed consent forms and had also collected informed consent forms from the parents of the students, agreeing to the video-recording of the teaching sessions.

Data analysis

We started by familiarising ourselves with the material by viewing the Zoom recording of the conversation individually and together. We had the recording initially transcribed by a professional bureau, using standard Norwegian spelling, and then read carefully through it while watching the recording again, correcting mistakes in the transcription, adding details, and checking for correct understanding. We roughly coded the entire conversation using codes for the topics being discussed, taking notes describing what was going on in the conversation.

We then individually read through our initial coding and notes, commenting and questioning, before discussing the preliminary coding and understanding. At this stage, we had an inductive approach, where coding was driven by the data.

We then started a more deductive process, using categories from theory and research to code the data. We divided the conversation into episodes based on whether or not they included *pedagogical reasoning* (Kavanagh et al., 2020). We characterised utterances using the concepts from van Es et al. (2017) of *attending to*, *elaborating on*, and *reasoning about* instruction, and we used Horn's (2020) descriptions of pedagogical *action*, *reasoning*, and *responsibility*. In this process, we tried to identify the episodes where pedagogical dilemmas (Lampert, 1985) came to the surface and were further discussed.

The analysis process was not linear. We went back and forth between the inductive and the deductive processes. Throughout the entire analysis process, we maintained a reflexive attitude, questioning our own interpretations and discussing points that might be ambiguous. In writing the analysis, we have striven for transparency, letting the material speak through citations from the transcription, separated from our interpretations and comments by physical frames, so that readers may make their own interpretations.

Analysis and results

PSTs' initial noticing and reasoning

The starting point of the analysis was the golden moments chosen by the PSTs, and the reasoning they initially used to explain why they had chosen these moments. We saw them as representations of what features of instruction the PSTs noticed on their own as a group, before the reflection conversation started.

The PSTs had chosen three clips from their practicum video, showing what they characterised as two golden moments used, and one golden moment lost. They had chosen all three moments from act 1, a situation where Simon had shown the first-grade class a MineCraft video showing three-dimensional blocks of different colours being built on top of each other to form a figure.

Simon followed the 3ACT protocol and asked questions – what did they notice, and what did they wonder about? The box below contains transcriptions of the golden moment the PSTs chose, translated into English:

Golden moment 1 – used:

T: Do you have any other questions to the movie?
S: How many blocks were there?
T: How many blocks were there? A very good question.

Golden moment 2 – lost:

S: What was it, really?
T: It was a figure
S: A figure?
T: It looks like a figure
S: Figure?
T: A square is a figure, a triangle is a figure – lots of things can be figures

Golden moment 3 – used

S: How many pink, purple, and yellow were there?
T: I don't know if you can see it now, but we can… Do you see? These are the different coloured boxes. There is one purple, one yellow, then one red. Those were the blocks. These squares down here.
S: I'm very good at building things.
T: That was a good question, really. How many are there of the different colours? How many are purple? How many are yellow? How many are red? That's a good question.

All three moments showed a student asking a question connected to the video they had seen. The golden moments described as used are from when the student posed a 'good' or 'relevant' question of the kind the PSTs were looking for. The moment described as lost is from when a student asked a different kind of question – 'what was it, really?'

After presenting the first golden moment, Simon was asked to say why the first clip represents a golden moment used, and he says:

> *Simon: Yes, I think this was an example of the student asking a question he was wondering about and posed a constructive question. It was the question we were looking for. It was clear that he had understood what he was supposed to do.*

Simon explained that the question from the student was one of the questions they had anticipated and planned for. He added that it is very difficult for 1st grade students to pose questions, and the student here shows that he has understood the task.

Simon said that he had tried the 3ACT in another 1st grade class, in which they did not know how to pose questions. Therefore, the practicum group had revised their original plan. They had a lesson the day before to work on posing questions.

Simon's reasoning shows that his instructional purpose with the activity was to get the students to pose the mathematical questions that they could work on together in act 2. His professional judgement is also guided by his responsibility and concern for the students, worrying that they are too young

and immature, and that the task is too difficult for them. The same concern is visible several times in the conversation:

> *Simon: The students were supposed to choose the question to elaborate on. But we skipped that, because we don't think the students would have the ability to make such a logical choice. We can't write it up for them either because they don't know how to read.*

Simon's initial reasoning about this as a golden moment is that the student who asked the question had understood 'what he was supposed to do'. By this claim, he reveals that his purpose with the activity in act 1 is to get the students to pose the 'right' kind of question – a mathematical one, which can be explored further.

This is not, however, in accordance with the description of act 1, which is designed to have the students wonder and ask questions.

The process of posing pedagogical dilemmas

Our analysis of the conversation that followed resulted in three pedagogical dilemmas that were further discussed, and where the initial description and understanding of the dilemma was revised in the course of the conversation. They all have to do with what can be considered a core practice in ambitious teaching: responding appropriately to student initiatives.

- *Save or answer?* Should we save all questions for the 'bank of questions', or should we answer some of the questions there and then?
- *Evaluate?* Should we evaluate the questions we see most suitable to be discussed in act 2 as 'good questions', or not?
- *Write up?* Should we record the student questions on the board, or not?

In the following, we will present how the dilemmas surfaced during the conversation, and show how the understanding of them was discussed and revised.

Save or answer?

In the conversation that followed Simon's initial reasoning for what he considered a golden moment used, campus teacher Celine challenged Simon to reflect on how he responded to the student contribution, and posed the first dilemma: *Save or answer?*:

> *Celine: Can I ask you something? Simon, you took some questions and answered them there and then. Others you kept for your bank of questions. You didn't write them up; you just repeated them and kept them. But how did you make that judgement in that moment, which questions to answer and which to…*
>
> *Simon: The ones I answered were really the ones more related to … Like, why did you do that, and why did you do this. And then they asked the question, yes, what is it supposed to be? And I was like, well, it's just supposed to be a figure. One of the questions were 'why did it turn out like that?' Those weren't questions that we could find answers to or explore further. They were questions to… what should I say… meta-questions.*
>
> *Sally: Yes, right, just that one – 'what was it?' – that's one they could have explored more themselves, because I think, they are first graders. If it was a crocodile, they would have figured out that it was a crocodile. That's what I think, anyway.*
>
> *Simon: I guess I could have. I see in hindsight that it was a mistake to answer some questions, like, generally. But that's that.*

Simon initially follows the same line of reasoning that he started out with. He claims that some of the student questions are not the kind they could explore further. His peer PST Sally then disagrees with him, saying that the students might have been able to explore some of the questions further. By this, she suggests a different possible pedagogical action, reflecting a more ambitious vision for the first-grade students.

It is not clear if it is the prompt from Celine or the input from Sally that gets Simon to revise his first position, but in this excerpt, we see that he

somewhat reluctantly admits that it might have been a mistake to treat the different student contributions differently.

As Sally goes on to present the second film clip, the moment characterised as a golden moment lost, she refers back to this part of the conversation. They are still discussing the same dilemma, *Save or answer?*, and Sally gets support from Susan:

> *Sally: What we talked about before – when a student asked 'What was it?' Meaning, what did we see in the video? And then Simon answered it. That was kind of a lost moment. They could have talked about it in groups, for instance, or like this: What did we see? What kind of figures were there? We could have included it in the bank of questions.*
>
> *Susan: Yes – it's the fact that it was answered. That's okay. He says that it was a figure. But then he could have followed up and asked 'what is a figure?' What does a figure look like? Can a figure be anything, or is it something specific?'*
>
> *Simon: If we had done that, it would have been a distraction from what they were supposed to do. Which was answering the question.*

Both Sally and Susan use their knowledge about the context when they suggest various responses to the dilemma of whether or not to include all questions in the bank. They illustrate how they could have elicited students' thinking by including all the questions, but Simon is still not quite convinced. He defends his choice not to include all the questions in the question bank, even if he already has said that it was a mistake to answer some questions there and then.

The reflection conversation carries on, and Simon is challenged once again, this time by campus teacher Carla, who tries to lift his reasoning to a more general level. She asks him to reflect on why he acts as he does in the situation where he answers some of the questions, thereby implicitly considering what reasoning lies behind his decisions.

> *Carla: Thinking about which questions and answers… should one answer them, or what should one do? How should one follow up?*

> *To what extent should one follow up?… should one follow up on everything or which choices do you do there and then?*
>
> *Simon: I choose to answer some, and then I go on. I say that that was a good question if I remember it. But I think maybe it would have been better to let everything pass as interesting questions to ask. That would have gotten us more into asking questions – if we didn't answer them. That was a great question, and that is a question. Answering some questions at the same time becomes a distraction from what we want them to do, which is asking questions. If we give the impression that some questions are better than others, it becomes more unsafe for the students to ask questions. If all questions are good questions, then I think we would get to a point where everyone could contribute.*

We see that Simon's initial understanding of the instructional purpose of Act 1 is to get the mathematical questions asked, so that they can move on to Act 2 – deliberating on a chosen mathematical question. During the conversation, however, he is repeatedly challenged on this perception, and in this excerpt, he *elaborates* on his observations and revises his understanding.

His initial perception of 'what the students are supposed to do' is revised from 'answering the question' to 'ask questions'. In line with this, what he describes as a 'distraction' has changed from the student asking too many questions, to himself answering some of them. His reasoning has changed from showing responsibility for the young and immature students with a task too difficult for them, to showing responsibility for inclusion, and appreciation of student contributions. This is more in line with the ideal from the 3ACT.

Evaluate?

The next dilemma, *Evaluate?*, is posed by the PST Sally. When students ask the questions that the PSTs were expecting, and hoping for, Simon, who is leading the conversation, immediately evaluates the questions as 'good'. In the reflection conversation, Sally reflects on this with reference to the instructional purpose of student participation:

> *Sally: Simon said that he [the student] had a good question. We wanted to figure that one out. [Meaning: we wanted this to be the mathematical question to be explored further] But that is what we had decided to do. Because he asked the question we had planned to pick. But what he [Simon] said… What if the student sitting next to him also thought he had a really good question, and we didn't pick it. Then he might think 'Why didn't they pick my question?'*

Here we see that Sally *integrates* the observations into the reasoning about the instruction.

Later in the conversation, campus teacher Celine returns to this point, and challenges Simon to say more about this:

> *Celine: But what is a good question?*

> *Simon: A good question for us as teachers is a question that the students can find an answer to. Something to explore and figure out and that is relevant to the video they have seen. The kind of questions we got from this guy. But I think that it would have been better for the students if we didn't give the impression that we were looking for specific questions. Once we said 'very good' to this question and answered that question, they were confused about what we were looking for. They always seek to give us what we are looking for. It would have been better to get hold of all questions, no matter what they were about. To get them more active and safe. Then we could have chosen the question in the end, like they did, and the round of questions wouldn't have been coloured by what we were looking for.*

Simon's answer at this point is quite elaborate and well founded, as he integrates the observations in his reasoning about instruction, again showing responsibility for, and appreciation of, student contributions. His revised evaluation is in line with the design of the 3ACT, but in contradiction to his actions at the time.

Practicum teacher Petra and campus teacher Carla follow up:

Petra: And maybe when they are so young, we didn't need to say that it was a good question. We could have said that; yes, now you asked a question. Does anyone else have a question? Because I think some of them got 'That was a good question', and then some of them withdrew a bit. They became insecure. Was my question not good enough? And that might lead to them not participating next time. So maybe we could drop the 'That was a good question', and rather say 'Yes, now you have asked a question'.

Carla: Yes, I also thought about that. Because what is a good question? What is not a good question? And how clear was it for the students what you considered a good question?

Simon: It's almost like we shouldn't have had any thoughts about looking for a good question.

Practicum teacher Petra here explains Simon's actions in the moment, giving him a basis for understanding his actions in the classroom. Carla draws attention to the fact that the students might not have the same understanding of what a good question was. Subsequently, Simon revises his initial understanding of the situation.

Write up?

A third dilemma in the reflection conversation concerns whether or not to write the student questions on the board. Simon chose not to write the questions on the board, as the 3ACT protocol suggested to do.

Susan comments on this and suggests that a different decision could have changed the conversation for the better:

Simon: I felt that the whole thing about writing on the board became a negative thing for the students. They didn't know how to read, and it took too long.

Susan: I think maybe it would have been a good idea to write some key words, even if the students can't read them. It's like we talked

> *about, if it's good or bad, it feels good to get your contribution on the board. No matter how relevant your question is, really. It could have been a positive thing to get it on the board, maybe more students would have contributed then.*

We see that once again Simon's reasoning shows responsibility for the young and immature students. Susan's reasoning, on the other hand, shows responsibility for inclusion, and appreciation of student contributions. Writing everyone's contributions on the board would have been a way of showing such appreciation. Susan disagrees with Simon's initial reasoning about his actions. Simon takes her point, but is not immediately willing to surrender:

> *Simon: Possibly. It's hard to tell how they would have reacted, really, without being there and doing it.*

> *Petra: Because you have experienced that in the other room, haven't you, that when you wrote things on the board, the students started doing other things. Because you need to have their look on you all the time. But I think maybe some key words … Just writing down very briefly, to get them back on the hook, and then you say 'Now I've written down what you said'.*

> *Simon: For instance, the question 'How many blocks were there all together?' I could have written 'How many blocks'?*

Here, practicum teacher Petra both supports Simon by expressing understanding for his choice in the situation, but she also supports Susan's input. Eventually, Simon concurs and exemplifies how he might have done what Susan and Petra both have suggested.

Discussion

We asked the research question: How do preservice teachers develop their ability to notice and reason about ambitious teaching practices through a video-based reflection conversation?

Development is a feature that is hard to observe, but if the PSTs change the way they describe or evaluate their teaching practice, it might be a sign of development in the practice they are participating in, which – according to Horn (2020, p. 323) – includes both instructional and reasoning practices. We looked for such changes in descriptions or evaluations.

If we look at what the PSTs in our case initially noticed, we see that they are not really focusing on features of ambitious or dialogic pedagogy in their observations or reasoning, nor are the chosen moments posed as pedagogical dilemmas. This corresponds with what Jacobs and Spangler (2017) say about the difficulties PSTs have with noticing what is important in instruction. It is not surprising that noticing ambitious pedagogy is problematic. Van Es et al. (2017) argue that it is the PSTs' prior experiences in the classroom that inform their observation and reasoning about instruction, and the chosen golden moments could very well be examples of this.

The instant evaluation Simon makes when he gets a student response he is expecting and waiting for, or not, constitutes an example of an IRE structure (teacher initiation, student response, teacher evaluation) (Mehan, 1979) that is very common in classrooms, but is not encouraged within dialogic or ambitious mathematics teaching.

Golden moments 1 and 3 are presented as golden moments used and are not considered as pedagogical dilemmas by the PSTs. Simon's initial reasoning about them shows that the instructional purpose that guides his actions is connected to a traditional student-teacher interaction, where he evaluates the correctness of the answer. He claims that the purpose is to get the students to ask the kind of mathematical question they can use in act 2, while the 3ACT purpose of act 1 is to get the students engaged, and asking questions. Through the conversation, however, the conflict between the purpose of prompting engaging questions versus the evaluative purpose becomes visible through the teacher educators' questions and can therefore be identified as dilemmas.

Golden moment 2 is presented by Sally as a golden moment lost. It is recognised by the PSTs as a pedagogical dilemma: *Save or answer?* Once the

conversation is concerned with this pedagogical dilemma, and also with the other two dilemmas identified in the analysis, the pedagogical reasoning surfaces and can be made explicit and discussed with the support of the practicum or campus teachers.

Horn (2020, p. 327) found that teachers rarely attend to pedagogical reasoning when discussing their own teaching practices. However, she found that when they did engage in pedagogical reasoning, they invoked pedagogical responsibilities as well, and linked it to their pedagogical actions (p. 328).

The reflection conversations that are part of the ReTPro rehearsing cycles are designed to get the PSTs to engage in discussions around their own teaching practice, making pedagogical reasoning explicit. We see that the teacher educators in our case conversation utilise several of the pedagogical practices suggested by Kavanagh et al. (2020): they prompt the PSTs to make them see the pedagogical dilemmas in the chosen golden moments, consider different alternative actions that could have been taken in the moment, and how that might have led the lesson in a different direction – and hence make their pedagogical reasoning explicit. The practicum teachers add valuable context information and understanding, supporting the PSTs in understanding their own actions in the classroom.

Kavanagh, Conrad, and Dagogo-Jack (2020) discuss the possible limitations of a practice-based teacher education and the risk that using Grossman et al.'s (2009) framework of offering representations, decompositions, and approximations of practice can become too instrumental and too focused on the visible part of teaching, that is, the what and how. The invisible part of why risks being overlooked. They see teaching 'as an interplay between knowing and doing, in which teachers are decision-makers who consistently face pedagogical dilemmas and employ professional judgment' (p. 3). The crucial concept is pedagogical reasoning.

The PSTs in our case study have gone through four learning cycles which include representations, decompositions, and approximations of ambitious practices in their mathematics course. Still, we see that their initial reasoning in this case is coloured by reasoning guided by traditional purposes of instruction when they are trying to adapt the 3ACT to a multifaceted and complex classroom of 1st grade students. This illustrates the difficulties PSTs have in developing new ways to attend to, and reason about, instruction (van Es et al., 2017).

Taking a situative perspective, learning to enact 3ACT in classrooms is not about copying the pedagogical actions suggested in the protocol. It is about making it meaningful with the particular students in the particular situation, and articulating the reasons for the choices made (Horn, 2020).

We found that, through engaging in the reflection conversation, the PSTs gradually saw that different paths could have been taken, and they became aware of the pedagogical dilemmas. We see how especially Simon, who is the PST acting as the teacher in the videoclips, changes the way he reasons about the dilemmas, using more elaborate observations and integrating the observations in his reasoning (van Es et al., 2017). We see that his descriptions of the situations go from the superficial to the more nuanced, increasing the level of detail and going deeper into the reasoning about instruction. His revised view shows more responsibility to the students' participation and exploration, which is crucial to dialogic teaching (Alexander, 2020).

Van Es et al. (2017) call for research that investigates how teacher education can create opportunities for PSTs to learn to notice and reason about ambitious instruction. We propose that reflection conversations such as this one could be an answer to that call. The initial phases of representation, decomposition, and approximation of practice are important, but the fourth phase of reflection – not only among the PSTs themselves, but together with both practicum and campus teachers – is what leads to what we interpret as the development of teacher noticing and pedagogical reasoning.

References

Alexander, R. (2020). *A dialogic teaching companion*. Routledge. https://doi.org/10.4324/9781351040143

Braun, V. & Clarke, V. (2013). *Successful qualitative research: A practical guide for beginners*. Sage.

Braun, V. & Clarke, V. (2022). *Thematic analysis: A practical guide*. Sage.

Cabot, M. A. & Brodal, J. (2025). 'Here, I should have used the talk move challenge…': Video-stimulated reflections on rehearsing vocabulary learning-friendly whole-class discussions. In M. A. Cabot, S. Høisæter, & V. Vangsnes (Eds.), *Rehearsing for teaching:Theoretical and empirical approaches to a practice-based teacher education.* (pp. 203–229). *Fagbokforlaget*.

Francis, D. W. & Hester, S. (2004). *An invitation to ethnomethodology: Language, society and social interaction*. Sage.

Gotwalt, E. S. (2023). Putting the purpose in practice: Practice-based pedagogies for supporting teachers' pedagogical reasoning. *Teaching and Teacher Education*, *122*. https://doi.org/10.1016/j.tate.2022.103975

Grosser-Clarkson, D. & Neel, M. A. (2020). Contrast, commonality, and a call for clarity: A review of the use of core practices in teacher education. *Journal of Teacher Education*, *71*(4), 464–476. https://doi.org/10.1177/0022487119880162

Grossman, P., Hammerness, K. & McDonald, M. (2009). Redefining teaching, re-imagining teacher education. *Teachers and Teaching*, *15*(2), 273–289. https://doi.org/10.1080/13540600902875340

Horn, I. S. (2020). 12. Supporting the development of pedagogical judgment: Connecting instruction to contexts through classroom video with experienced mathematics teachers. In G. M. Lloyd & O. Chapman (Eds.), *International handbook of mathematics teacher education: Volume 3: Participants in mathematics teacher education* (2nd ed., pp. 321–342). Brill. https://doi.org/10.1163/9789004419230_013

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.

Jacobs, V. R., Lamb, L. L. & Philipp, R. A. (2010). Professional noticing of children's mathematical thinking. *Journal for Research in Mathematics Education*, *41*(2), 169–202.

Jenset, I. S., Slotte, A., Nilsberth, M., Brataas, G. & Blikstad-Balas, M. (2024). The benefits of using videos for developing responsive teaching. In M. Blikstad-Balas & I. S. Jenset (Eds.), *Using video to foster teacher development. Improving professional practice through adaption and reflection* (pp. 45–59). Routledge.

Kavanagh, S. S., Conrad, J. & Dagogo-Jack, S. (2020). From rote to reasoned: Examining the role of pedagogical reasoning in practice-based teacher education. *Teaching and Teacher Education*, *89*, 102991. https://doi.org/10.1016/j.tate.2019.102991

Kavanagh, S. S., Metz, M., Hauser, M., Fogo, B., Taylor, M. W. & Carlson, J. (2020). Practicing responsiveness: Using approximations of teaching to develop teachers' responsiveness to students' ideas. *Journal of Teacher Education*, *71*(1), 94–107. https://doi.org/10.1177/0022487119841884

Kennedy, M. (2016). Parsing the practice of teaching. *Journal of Teacher Education*, *67*(1), 6–17. https://doi.org/10.1177/0022487115614617

Kulild, M., Cabot, M. A. & Iversen, T. (2025). Meaningful use of talk moves: Preservice teachers' self-reflections on individual student-teacher conversations. In M. A. Cabot, S. M. Høisæter, & V. Vangsnes (Eds.), *Rehearsing for teaching: Theoretical and empirical approaches to a practice-based teacher education.* (pp. 285–309). Fagbokforlaget.

Lampert, M. (1985). How do teachers manage to teach? Perspectives on problems in practice. *Harvard Educational Review*, *55*(2), 178–195.

Lampert, M. (2001). *Teaching problems and the problems with teaching*. Yale University Press.

Lampert, M., Beasley, H., Ghousseini, H., Kazemi, E. & Franke, M. L. (2010). Using designed instructional activities to enable novices to manage ambitious mathematics teaching. In M. Stein & L. Kucan (Eds.), *Instructional explanations in the disciplines* (pp. 129–141). Springer.

Lampert, M., Franke, M. L., Kazemi, E., Ghousseini, 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

Lomax, K., Alfonzo, K., Dietz, S., Kleyman, E. & Kazemi, E. (2017). Trying three-act tasks with primary students. *Teaching Children Mathematics*, *24*(2), 112–119.

McDonald, M., Kazemi, E. & Kavanagh, S. S. (2013). Core practices and pedagogies of teacher education: A call for a common language and collective activity. *Journal of Teacher Education*, 64(5), 378–386. https://doi.org/10.1177/0022487113493807

Mehan, H. (1979). *Learning lessons. Social organization in the classroom*. Harvard University Press. https://doi.org/10.4159/harvard.9780674420106

Stockero, S. L., Rupnow, R. L. & Pascoe, A. E. (2017). Learning to notice important student mathematical thinking in complex classroom interactions. *Teaching and Teacher Education*, *63*, 384–395.

van Es, E. A., Cashen, M., Barnhart, T. & Auger, A. (2017). Learning to notice mathematics instruction: Using video to develop preservice teachers' vision of ambitious pedagogy. *Cognition and Instruction*, *35*(3), 165–187. https://doi.org/10.1080/07370008.2017.1317125

Walshaw, M. & Anthony, G. (2008). The teacher's role in classroom discourse: A review of recent research into mathematics classrooms. *Review of Educational Research*, *78*(3), 516–551.