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Reflections on dialogicity: Challenges and suggestions by mathematics student teachers

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ABSTRACT

Research related to dialogic teaching has been gaining ground in recent decades. On a theoretical level, researchers have described how sociocultural approaches are linked to dialogic teaching. In addition, empirical studies have explained how dialogic teaching manifests itself in educational dialogue and classroom interactions. However, studies addressing how the dialogic theory and practice could be linked meaningfully in teacher education and professional development programs in subject teacher education and related praxis are still limited. Especially in the case of math teacher education, the reported professional development programs are limited in number. Whereas the tendency has been to report the challenges accompanying dialogicity, the present study contributes by making suggestions and delivering ways to enhance the dialogicity of math teaching. Most importantly, the findings reveal that this is done mostly by the student teachers themselves. Additionally, all of this can be considered a result of participating in an initial teacher education program, following a systematic and cyclic structure to develop one's understanding and skills related to classroom interactions that include dialogic approaches. Implications for subject teacher education are also discussed based on the findings of the current study.

1. Introduction

The importance of educational dialogue has been recognized in studies of classroom interactions for decades (Howe & Abedin, 2013; Mercer & Dawes, 2014). Despite varying terminology introduced in studies addressing educational dialogue and dialogic pedagogy (Haneda, 2017), the emphasis on dialogic aspect roots on mutual consideration of different voices (Bakhtin, 1986) and weight being given to students' as active participants in dialogue (Evans, 2007). Although not as voluminous in mathematics (Bakker, Smit, & Wegerif, 2015), the importance of dialogue has been acknowledged in mathematics and science education during the same period in recent decades (Alrø & Skovsmose, 2002; Bakker et al., 2015; Kazemi et al., 2016; Mortimer & Scott, 2003; Scott, Mortimer, & Aguiar, 2006; Lehesvuori et al., 2017). Despite being fundamentally dialogic by nature (Driver, Asoko, Leach, Mortimer, & Scott, 1994), science and mathematics in school have been assimilated with subject-centeredness, manifested as teacher-centred and authoritative forms of interaction (Cuban, 2017; Mercer, Dawes, & Staarman, 2009). Indeed, previous studies have shown that dialogue and dialogic interaction plays only a minor role in mathematics classrooms: In fact, teacher-centred approaches have been

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prevailing in mathematics classrooms for decades (Cuban, 2017). And, teachers still do not have exact models of how to orchestrate more dialogic interactions, even if they are aware that it will have a positive effect on students' learning (Lehesvuori et al., 2017). And, even if they do have initial preparation for reforms and student-centred approaches, they are still likely to regress during their early career years if appropriate support is not provided (Lewis, 2014). This should not lead to undervaluing the role of initial teacher education, rather there should be more input in equipping prospective teachers with effective professional development tools for the future career.

Fundamental ideas of dialogic teaching have been integrated into many teacher development programs for subject teachers (Davies, Kiemer, & Meissel, 2017; Hennessy, Warwick, & Mercer, 2011). Some programs have focused specifically on dialogic teaching and dialogic inquiry in science (Lehesvuori et al., 2011a, 2011b) and others on argumentation in science and mathematics (Lehesvuori et al., 2017; Simon, Erduran, & Osborne, 2006). These studies underline the importance of dialogic pedagogy, including activating students, eliciting and using their ideas and probing for further thinking. These essential features are also underpinned in review study by Walshaw and Anthony (2008). Although acknowledged, studies addressing how these features could enhance meaningful learning in mathematics are still scarce (Díez-Palomar & Olivé, 2015), as are studies on how this could be practiced systematically in subject teachers' preservice training (Lehesvuori et al., 2011a; van de Pol, Brindley, & Higham, 2017). Furthermore, beyond practice, gaining a deeper understanding of how the implementation of these features could be increased through systematic and explicit praxis is needed. Indeed, it has been shown that novice teachers' perceptions of their orchestration of whole-class dialogue do not match the reality; thus, structured support is needed to bridge this gap (Bennett, 2010).

Therefore, it is essential to develop teacher education programs whereby student teachers can practice dialogic pedagogy and explore in-depth features of dialogic interactions and their effects. In content-driven subjects, such as science and mathematics, implementing dialogic pedagogy is declared challenging (Lehesvuori et al., 2011a, 2017). While it has been deemed significant, it is also fragile when it comes to teaching and learning mathematics (Alrø & Skovsmose, 2002). This fragility can also be understood in relation to the balance between authoritative and dialogic interactions (Scott et al., 2006), which concretely means the teacher balancing decisions (Sherin, 2002), such as when to give space for more open discussions and when to close down and take control over the discussions on a specific topic (Lehesvuori et al., 2019). To acknowledge the challenges and move toward the possibilities coming along with dialogic pedagogy, initial subject teacher education should acknowledge this fragility while introducing more holistic descriptions of principles of dialogic teaching (Alexander, 2006). It has been noted that teacher education programs lack structure and explicitness concerning the development of teachers' classroom interactions. More specifically, it has been recognized for some time that teachers' learning and development are more effective when linked to classroom experience (Putman & Borko, 2000) and supported with video-based activities for more structured reflection (Borko, Jacobs, Seago, & Mangram, 2014; Marsh & Mitchell, 2014; Sherin, 2007; Sherin & Han, 2004; van Es & Sherin, 2002; Whittaker, Kinzie, Williford, & DeCoster, 2016). However, studies on the effect of dialogic pedagogy interventions already during teachers' preservice training are lacking.

Work still needs to be done in relation to how the theory is linked to practice. Yet, this is all in terms of acknowledging and exemplifying the difference between dialogic as a theory and dialogic as something to aim for in actual classroom interactions (Lefstein, 2010). In the present study, a theoretically grounded observation protocol was designed by integrating aspects of educational dialogue using principles of dialogic teaching (Alexander, 2006). This is line with instructional dialogue described in the teaching through interactions (TTI) framework (Hafen et al., 2015; Hamre et al., 2013). Although the consideration of the subject content and knowledge building has been criticized as often being neglected in studies focusing on classroom interactions (Barreto, Rodrigues, de Oliveira, et al., 2021), there is a continuous call in highlighting the importance of the pedagogical aspect and of the quality of classroom interaction in terms of challenging and enriching the prevailing authoritative nature of classroom interactions in mathematics and science (Cuban, 2017; Lehesvuori et al., 2013, 2018). While the context of this study is mathematics teacher education, the pedagogical approaches introduced may avail educational research and teacher education in general.

By applying a theory-based observation protocol, mathematics student teachers were able to delve into the dialogic aspects of classroom interactions through systematic observations of their own and their peers' video-recorded lessons. In this study, we explore how and to what extent student teachers notice specific moments of classroom interactions (cf. Wiens, LoCasale-Crouch, Cash, & Escudero, 2020), as well as how they bring out confronted challenges, see the possibilities, and provide suggestions in order to take the next step toward enhanced dialogue in mathematics classrooms.

1.1. Theoretical background

1.1.1. Dialogic teaching

Dialogic aspect is fundamentally understood as the mutual presence of different ideas and voices (Bakhtin, 1986). Dialogic pedagogy has been gaining ground in education (Matusov, Marjanovic-Shane, & Gradovski, 2019) alongside sociocultural approaches that highlight the roles of communication and verbalization as crucial elements for learning (Vygotsky, 1978). Briefly, social processes are highlighted in sociocultural approaches; that is, discussions taking place in the social plane are seen as crucial for internationalization and, furthermore, are connected to intrapsychological processes. In practice, this results in theoretical justifications for more discursive and collective activities in classrooms (Mercer & Littleton, 2007).

Alexander's (2006) descriptions of dialogic principles have been increasingly used in teacher education programs (e.g., Davies et al., 2017; Sedova, 2017; Simpson, 2016). Alexander's (2006, p. 28) dialogic teaching includes the following five principles, describing teaching as:

- collective: teachers and students address learning tasks together, whether as a group or as a class;

- reciprocal: teachers and students listen to each other, share ideas, and consider alternative viewpoints;
- supportive: students articulate their ideas freely, without fear of embarrassment over "wrong" answers, and they help each other to reach common understandings;
- cumulative: teachers and students build on their own and each other's knowledge and experiences; and
- purposeful: teachers plan and facilitate dialogic teaching with particular educational goals in view.

Although these principles have been adapted to science and mathematics teacher education programs to introduce the holistic nature of dialogic teaching (Lehesvuori et al., 2017), some attempts to adapt these principles to systematic observations of classroom practices have also been done recently within some observation protocols. For example, Pianta, Hamre, and Mintz (2012) developed the Classroom Assessment Scoring System - Secondary (CLASS-S) observation instrument, based on the TTI framework (Hafen et al., 2015), where the principles of dialogic teaching are partly present within one dimension called instructional dialogue. Also some reflection frameworks for teaching mathematics have been introduced (Merrit, Rimm-Kaufman, Berry, Walkowiak, & McCracken, 2010). In Merrit and colleagues framework some features of dialogicity, such as open-endedness and collectivity, can be reflected with help of guiding questions. For preservice teachers, however, it is essential to provide protocols via explicit features and indicators of dialogic teaching that can be captured via live or video-recorded observations. The importance of teacher noticing has been acknowledged also in the context of mathematics and science (Borko, Jacobs, Eiteljorg, & Pittman, 2008; Sherin et al., 2013; Stockero, 2008; Stockero & Van Zoest, 2013); yet, it has been continuously brought up that novice teachers' noticing of students' thinking should be more extensively considered (Amador, 2016; Star & Strickland, 2008). In relation to this, as the dialogic aspect is fundamentally about bringing in and taking into account different ideas, it could enhance teachers' consideration of students' thinking. When it comes to the rationale of this study, it is important to provide preservice teachers with accessible and more explicit information about the notable features and indicators of dialogicity beyond the abstract level; that is, beyond the level of principles. In this study, from now on, by using the term dialogicity, we do not place different levels, approaches and descriptions of dialogicity in rivalry position; rather we welcome them openly to challenge the prevailing authoritativeness (Lehesvuori et al., 2013).

1.1.2. Educational dialogue and dialogicity

Perhaps the most fundamental form identified in educational dialogue is the initiation-response-feedback (IRF) pattern of classroom talk (Sinclair & Coulthard, 1975). The triadic pattern is related to question-answer routines, and it has been found to be the dominant form of interactions in science (Lemke, 1990; Mercer et al., 2009) and mathematics (Wood, 1998) classrooms, which also hinders classrooms from developing more dialogic practices (Mercer & Howe, 2012). Indeed, while the IRF pattern is often linked to authoritative teaching approaches, whereby the focus is on science's point of view (Mortimer & Scott, 2003), the nature of the questions and the teacher's feedback could make a difference when aiming for more dialogic and extended exchange patterns. Briefly, this means that questions would be more open by nature to promote students' thinking (Chin, 2007; Shahrill, 2013) with no right or wrong answers. Open-ended and authentic questions and tasks can be considered essential elements in problem-based, argumentative and dialogic teaching in mathematics (Hähkiöniemi and Francisco, 2019) meeting the requirements of the renewed curricula emphasising problem-based approach and communication skills (The Finnish National Board of Education (FNBE), 2014). Furthermore, teachers' feedback/follow-up moves would not be evaluative by nature (Cullen, 2002); rather, they would include perpetuation (Bansal, 2018) or probing moves (abbreviated as P) to expand on ideas and push students' thinking further. Therefore, the resulting pattern is more of an IRPRP chain (Scott et al., 2006). This exchange pattern has been assimilated with facilitation strategies of instructional and elaborated dialogue, characterized by features such as open questions, repetition, extension, and active listening (Pianta et al., 2012). In terms of foregrounding the context and how extended dialogue could take place in mathematics teacher education, an extract of the classroom data collected alongside this study is presented briefly below:

Student teacher: Well then! How about that parallelogram? How can the area be defined? Anne?

Student1: Should you be cutting from there ((shows with hands)) so you would be getting a rectangle?

Student teacher: ((Looks another student who talks)) Did you get it like that? All right! So how did this go? ((wonders and moves to projector)) The equation for area was like multiplying this by this, and how could you demonstrate it with this? ((twisting and turning the plane figures in her hands while student interrupts)).

Student2: Hey! That's how I did it!

Student teacher: Yeah! So you cut from here and placed it there?

Student3: Well that was easy!

Student teacher: Well hey! It looks like a rectangle doesn't it?

Several students: Yes!

Student teacher: Well how about this trapezoid then? You got it! ((moves closer to students and nods at student who indicates getting it done)) Anyone else? How would you justify the area with these? ((discussion continues)).

The extract demonstrates how a student teacher has placed herself as someone who co-wonders with students and lets them guide empirical demonstration. Despite orchestrating the dialogue, the decrease in the ownership leads to extended dialogue within students deliver suggestions and comments. While we have seen the decrease in ownership of the content and activities has led to more dialogic interactions especially in science (Lehesvuori et al., 2018), we expect it to have similar potentiality also in mathematics. In addition to the previous example, the dominant IRF pattern can be broken in different ways, and it has the potential to increase dialogic interactions among students when delivered with new rules to engage in educational dialogue through openness and criticality (Gillies, 2016; Littleton & Mercer, 2013). Releasing and taking back the control of the subject content is, however, challenging and requires understanding and repertoire of the communicational approaches coming along with opening up and closing down discussions

(Lehesvuori et al., 2013).

Having said this, the tension between authoritative and dialogic forms of interaction seems to be in-built in math and science classrooms (Lehesvuori et al., 2019), which could be understood more as the driving force of meaningful discussions (Scott & Ametller, 2007) with different forms of interaction seeding one another (Scott et al., 2006). Aligning with Alexander's (2006) principles of cumulativeness and purposefulness, the importance of subject and content-driven exchanges has been highlighted in classroom observation protocols for instructional dialogue (Hafen et al., 2015). However, a strict focus on content may be detrimental for more authentic and dialogic forms of interaction, as the dialogic space is hindered by teachers directing the talk in a desired direction. The balance between mathematical content and dialogicity is challenging (Sherin, 2002); yet, some explicit remedies are available to open up dialogic spaces for students' ideas and student-driven discussions. The simplest but perhaps the hardest tactic, especially in whole-class discussions, is the use of wait time (Chin, 2004). Indeed, open and authentic questions are often vitiated with insufficient wait time and teacher interruptions. Another easily observable feature, although its function is not fully understood, is the use of repetition (Hellermann, 2003). Indeed, recognizing the purpose of the repetition requires consideration of prosody and intonation when deciding whether the teacher is evaluating (lowering intonation) or welcoming further ideas (raising intonation; Lehesvuori et al., 2017).

Aspects of dialogicity have been addressed and practiced in various student teacher programs. Whereas some have focused on observing and implementing various aspects related to dialogicity (Lehesvuori et al., 2017), others have had a more focused aim, for example, on more open questioning (Oliveira, 2010). In any case, it is expected that observing and noticing, planning and implementing, and finally reflecting on dialogic pedagogy require both theoretical foundations and explicit examples to initiate teacher education programs, resulting from increased awareness (Desimone, 2009). Thus, actions and tools to enhance teacher training practices should be systematic and structured.

1.2. The aim of the study

The aim of the present study is to determine how mathematics student teachers reflect on dialogicity in classroom interactions during mathematics lessons in their teaching practices. We expect that instead of only noticing dialogic indicators from lesson examples, they will expand on their dialogic teaching and provide more in-depth reflections through the help of video examples of their own and peer's lessons (cf. Rosaen, Lundeberg, Cooper, Fritzen, & Terpstra, 2008). In the study, we will address the following research question:

- What are the indicators, challenges and suggestions coming along with dialogicity as reflected by mathematics student teachers in their own and peer' lessons?
- What are the noticed indicators helping student teachers to shift from challenges to suggestions and possibilities?

The findings will provide more information on student teachers' online reflections of dialogicity and how they experienced it, triggered by video clips of their own and their peers' mathematics lessons during their teaching practice period. As expected, the student teachers will tend to bring up common challenges in relation to dialogicity (Lehesvuori et al., 2011a). However, we will also focus on the possibilities and suggestions provided by the student teachers.

2. Method

2.1. Participants and procedure

2.1.1. The program and the participants

The preservice teacher training program was conducted with different student teacher groups with slightly different thematic emphases, depending on the group's experience, interests, and different schedules for execution. The program was integrated to existing courses that were all to be updated since the renewed teacher education curriculum. Thus, the time and context was fruitful for bringing in the classroom interaction more strongly and structurised to both primary teacher as well as subject teacher education. The program was abbreviated as VOPA, and the translated meaning of the entire name of the program includes emphasising the role of classroom interaction as a basis for teaching and assessment. When it comes to the assessment, the focus was again on interactive aspects of assessment, emphasising the activation and use of student thinking (Ruiz-Primo & Furtak, 2007; Kazemi et al., 2017).

In this study, the focus is on a mathematics student teacher group of 13 students (5 male, 8 female) during their teaching practice period. The selection is based on authors' background in science and mathematics education research. In Finland, subject teacher training is usually conducted during an intensive one-year period in the departments of teacher education and teacher training schools, where lessons are supervised by tutor teachers. Furthermore, basic studies in education are conducted before this intensive one-year period. While science teacher posts in Finland consist of a major subject, it is often mandatory to teach second and even third subjects in secondary schools. For example, mathematics teachers are required to teach for example physics and/or chemistry. This way the training also includes science subjects and related pedagogy. Thus, also the theoretical background for mathematics and science teacher education partly overlap between subject disciplines.

The program was cyclic by structure, and each cycle focused on a specific theme related to teacher–student classroom interactions. The program structure and rough schedule are presented in Fig. 1. It was in total integrated in a course addressing pedagogy of mathematics. The course included also a research part in which student teachers studied their own teaching from videos. With the mathematics student teacher group, the themes were teacher sensitivity, feedback, and dialogicity. The order of the themes was

discussed among the researchers and educators. For the mathematics group, dialogicity was selected as the last cycle, since it was considered the most challenging theme based on our previous experiences (Lehesvuori et al., 2011a, 2011b, 2017). Each cycle included three phases:

1. an introductory theoretical workshop;
2. video recording of a lesson and selecting an example for reflection; and
3. joint reflection session on selected examples.

Thus, the structure of a cycle followed a fundamental triadic cycle that included crucial elements for teacher development (Westerman, 1991). More specifically, aspects of "knowing," "seeing," "doing," and "reflecting," as introduced by Hamre et al. (2013), were repeated in the program. After each introductory workshop there was an average two months period within student teachers video-recorded, self-reflected and selected an example for the joint reflection session. While subject student teachers' practice lessons cannot take place at the same time in teacher training school, the extended time between introductory sessions and joint reflection was justified.

The themes for the cycles were aligned partly with those introduced in the TTI framework (Hamre et al., 2013); however, they were selected and adjusted by considering experiences from previous teacher education programs on classroom interaction (Lehesvuori et al., 2011a). For example, in the case of dialogicity, indicators of the instructional dialogue dimension (Pianta et al., 2012) were aligned with principles of dialogicity (Alexander, 2006), resulting in a theory-based observation protocol that could be used not only for observations, but also for more in-depth reflections of one's own and analyses of peers' video-recorded lessons.

2.2. Data collection

The data collected in all three cycles included audio-recorded workshops, video-recorded mathematics lessons, and onsite audio-recorded reflections of one's own and peers' lesson examples. However, due to the COVID-19 lockdown, the last cycle, especially the reflection session on dialogicity, was organized differently; that is, instead of bringing all of the students to the same joint onsite reflections, the group was divided into five subgroups formed by the student teachers themselves. Three groups included three student teachers, and two groups included two student teachers. This led to five ($n = 5$) online screen recordings, using the Zoom video conference tool. The preliminary analysis of all joint reflection sessions initiated extensive and in-depth discussions, leading to a rich dataset focused on a single theme (dialogicity) and, thus, leading to an exploration of the theme in the study.

The purposeful data sampling for this study is firmly based on the uniformous group of mathematics student teachers, then divided into subgroups, discussing the same phenomena (Patton, 2015). Therefore, the data analysed in this study consists of the groups' online reflections on the theme dialogicity. The mathematical context and topics of the clips selected, discussed and reflected by the student teachers are presented in Table 1.

2.3. Data analysis

The data analysis followed the principles of data-driven thematic analysis, which emphasizes flexibility when approaching data and analyses (Braun & Clarke, 2006). The following analytical steps were included:

1. Getting familiar with the data;
2. Marking student teachers' utterances;
3. Creating main themes and subthemes, based on the emerging features; and
4. Coding and inter-rating the data

Table 2 presents the formed major themes and subthemes with descriptions and their frequencies. The major themes include the student teachers' noticing features of dialogicity, either based on observations or derived from them, as well as their suggestions and possibilities to enhance dialogicity in addition to the challenges associated with its implementation (cf., Lehesvuori et al., 2011a). Thus, major themes address more so the function and target of the turn and if the turn was about:

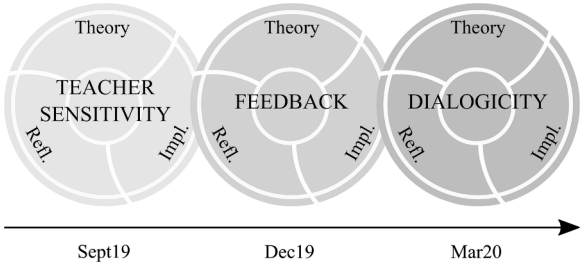

Fig. 1. The VOPA program for the mathematics group.

Table 1
The mathematical topics of the presented, discussed and reflected clips of the groups.

	Group1 (3 students)	Group2 (2 students)	Group3 (3 students)	Group4 (3 students)	Group5 (2 students)
Clip1	*Circle area:* Using radius instead of diameter when calculating the area (Student challenges: "Why not diameter?")	The line of height for different looking triangles: Drawing line of heights for different triangles	*Sector area:* Introductory task proceeding from half circle to quarter of circle	*Circle area:* The diameter is given, find out the area	*Quadrangle area and area units:* "Winnie the Pooh's Hundred acre woods" in comparison to Finnish translation
Clip2	*Wall areas:* Minecraft building. Finding out the area of the walls and number of the blocks?	(Clip missing due to cancelled lesson. Discussing the above clip)	*Exploring different types of triangles:* Perpendicular, acute- and obtuse-angled triangles	*Cone area:* Finding out the area by using cube	Power and work (physics): Running the stairs
Clip3	*Naming different shapes:* Exploring polygons and other shapes	–	*Subtraction and number line:* Two positive temperatures (Celsius) and two negatives. Finding out the difference.	*Inequation:* Opening up the homework together. Finding out persons' age by forming inequalities.	–

a. Noticing indicators of dialogicity;
b. Reflecting on challenges in implementing dialogicity or actual reasons why strategies and elements of dialogicity were successfully or unsuccessfully implemented; or
c. Reflecting further on the possibilities of dialogicity and offering suggestions to develop one's teaching toward being more dialogic.

Some infrequent major themes were also considered relevant for the sake of discussion, although limited in number (i.e., d. Threads and e. Other). In the Other theme, the utterances containing unspecified comments about dialogicity or dialogic principles were included (i.e., student teachers did not open up indicators related to a specific principle). However, these utterances were rather few (n = 8), which indicates the observation protocol's influence on breaking the principles and strategies into more explicit pieces that can be used to verbalize classroom interaction phenomena. *Subthemes* were created based on the content of a student teacher's comment. Although the data-driven approach was considered, the indicators described within the program occurred in student teacher reflections; thus, as an overall result, the majority of the themes retell the indicators described in the observation protocol (e.g., open questions, repetition, wait time).

One online speaking turn could consist of several sentences addressing either one theme or several themes. The latter was, for example, usual when a student teacher was noticing and listing indicators of dialogicity from a peer's clip. If a student teacher repeated the same theme within the same turn and context, the theme was not coded twice. While the observation form was used in preliminary reflections of one's own lesson and for self-selection of example clips, the created subthemes partially followed the form. Yet, student teacher comments contribute to and extend the form, especially when it comes to linking content to the reflections. Thus, it could be considered that momentary reflections were not only on pedagogical knowledge or content knowledge but also on pedagogical content knowledge (PCK; Shulman, 1986). Creating opportunities for reflections addressing PCK is essential in subject teacher education and intervention programs (Kilic, 2018b); thus, it is also worthwhile to explore these reflections.

Another clear divider in the reflections was whether they were addressing one's own or a peer's lesson clip. If a student teacher was noticing features from one's own lesson or suggesting improvements for one's own teaching, the reflections were coded as self-reflections (e.g., S2 means a self-reflection was considered by a student teacher from group 2; see right side column in Table 2). Similarly, reflections emerging from a peer's lesson clip were coded as peer reflections (abbreviated as P). If a comment was not directly linked to one's own or a peer's lesson and addressed challenges and suggestions on a general level, they were not marked with an S or P. Regarding direct reasons for successful or unsuccessful implementation of dialogic practices and approaches, the plus mark (+) relates to successful implementation and the minus mark (−) to unsuccessful implementation. As a clarification for the relating codes in Table 2 (see codes 38 = 3S + 18S− + 1S+ + 1P− + 15 on the left side column):

- Challenges and reasons for successful/unsuccessful implementation were brought up 38 times in total
- Personal challenges were brought up 3 times without a clear reference to a reason for success/unsuccess of a lesson incident (3S)
- Specified reasons for unsuccessful implementation from one's own lesson were brought up 18 times (18S−) and only one time for a successful implementation (1S+). A reason for unsuccessful implementation was brought up once from peer's lesson (1P−)
- Challenges of dialogicity were brought up 15 times. Out of which 10 comments addressed students/class being passive or silent (see subthemes)

2.4. Trustworthiness

The first author created the themes by doing the initial analysis with ELAN software to segment the video/audio data and transcribe the text. Main themes came into prominence through careful examination and constant comparison (Patton, 2015). A certain amount of student teacher utterances were transcribed and given to the third author to confirm whether similar themes were formed. Researcher triangulation (Miles & Huberman, 1994) was implemented and 20% of the utterances were coded by both the first and third author to ensure reliability and trustworthiness. Disagreements were discussed until joint agreement was established through

Table 2
Themes and frequencies (occurrences for each subtheme listed group by group in the order they occurred to trace the characteristic features for each group).

Main theme	Subtheme	Description and occurrence
Noticing indicators of dialogicity (72 = 27S + 52P) Left side: total sum of noticing	Distributed talk (15 = 7S + 8P)	Giving turns and activating several students/groups. Teacher does not do all the talking; rather, teacher activates students to express themselves verbally. There is shared responsibility and/or owenership (P1, S2, S3, P4, S4, P4, S4, S4, P4, P5, P5, P5, S5, S5, P5)
Right side: 3 x noticing from own clip +8 x noticing from a peer's clip	Wait time (11 = 3S + 8P)	Wait time is given to students when thinking about and responding to questions. Being patient when orchestrating dialogue and fostering timely discussions (P1, P2, P4, S4, P4, P4, S4, S4, P5, P5, P5)
	Open questions (11 = 2S + 9P)	Questions that have no right or wrong answers and seek to facilitate student thinking and extend dialogue and responses (P1, P1, P2, P3, P3, P3, P5, S5, P5, P5, S5)
	Student ideas considered (9 = 3S + 6P)	Student ideas are taken explicitly into account, not only via repetition but while building the link between student ideas and mathematics (P1, P1, S1, S2, S3, P4, P4, P4, P4)
	Repetition/extension (7 = 4S + 3P) [Within principle Collectivity and Reciprocality]	Teacher repeats student responses to highlight student's point of view and provoke further ideas (P1, S1, S2, S2, S2, P5, P5)
	Seek elaboration/probing (6P)	Follow-up turns and probe follow-up questions, seeking students' elaboration of ideas (P1, P1, P1, P4, P4, P5)
	Supportive feedback (4 = 2S + 2P)	Feedback is supportive, aiming at encouragement, engagement, and further thinking (P1, S1, S2, P5)
	Extended dialogue (4 = 1S + 3P)	Kinds of noticing chain patterns, including several student turns. Could include notions of timely discussions (P3, S3, P4, P4)
	Student active participation and student questions (3P)	Students ask questions that may be tossed back to students (P3, P3, P4)
	Active listening (3 = 1S + 2P)	Listening to students actively, for example, by circling around the groups (P1, S2, P4)
	Checking student understanding (2P)	Explicitly noticing the checking of student understanding in terms of keeping all attuned to joint discussions (P1, P3)
Suggestions and possibilities for enhancing dialogicity (75 = 32S + 8P + 35) Right side: 35 x bringing out suggestions and possibilities in general	Alternative representation of the task/ content – open approach (26 = 9S + 1P + 16)	Alternative representation of the task could be used to enhance more extended dialogue and idea sharing. Includes designing and implementing more open-ended tasks and strategies. Could include scaffolding through the question and task (S2, 3, 3, S3, S3, 3, S4, S4, 4, 4, S4, P4, S4, 4, 4, 4, 4, 4, 4, 4, 4, 5, S5, S5, S5, 5)
	Distributed talk (11 = 7S + 1P + 3)	Giving turns and activating several or other students/groups. Activating students to express themselves verbally. There is shared responsibility (S1, S1, S1, S1, S2, S2, 4, S4, P4, 5, 5)
	Using student responses/questions (10 = 4S + 6)	Student responses/questions and ideas are used when building on (joint) understanding. Students are activated to express their ideas, thoughts, and mathematical expressions verbally (1, S1, S2, S2, 3, 4, 4, 4, S4, 4)
	Seek elaboration/probing (10 = 3S + 5P + 2)	Follow-up turns and probing follow-up questions could be implemented to seek student elaboration of ideas (S1, P1, P1, P1, P1, S1, S2, 3, P4, 4)
	Questioning strategy (7 = 3S + 1P + 3)	Use of more open questions or finding a balance between open and closed questioning. Questions could be planned beforehand to initiate student thinking and extended dialogues (P1, 1, S2, S2, S4, 4, 5)
	Linking to everyday context (2)	Connections could be made to everyday context and examples (3, 4)
	Repetition (2 = 1S + 1)	Repetition could be used to emphasize student ideas and when building on it (2, S5)
	Proximality (S1)	Teacher could move toward students or among students (S2)
Challenges and reasons for successful/ unsuccessful implementation (38 = 3S + 18S− + 1S+ + 1P− + 15) Right side: S− reasons for one's own unsuccessful implementation S+ reason for one's own successful implementation P- reason for peer's unsuccessful implementation	Students/Class (18 = 1S + 6S− + 1P− + 10)	Students/Class were/was passive and/or silent (S1−, S1−, S2−, 2, P2−, S2−, S2−, 3, 3, 4, 4, 4, 4, 4, S4, 4, S5−, 5)
	Subject/topic (9 = 5S− + 4)	The subject/topic is not suitable for dialogicity and, for example, applying open questioning (S1−, S2−, S2−, S3−, 3, S3−, 4, 4, 4)
	Questioning strategy (4 = 2S− + 1S+ + 1)	Use of more open questions or finding a balance between open and closed questioning (S1−, S3−, S3+, 4)
	Pre-knowledge about students (3 = 2S− + 1S+)	The importance of pre-knowledge about students (S2−, S4−, S5+)
	Videoing/nervousness (2S-)	Videoing mentioned as a reason for hindering discussions and dialogicity (S2-, S5-)
	Alternative representation of the task/ content – open approach (1S)	Alternative representation of the task/content with a more open approach is hard to plan and implement (S3)
	Wait time (1S−)	Insufficient wait time provided (S5−)

(*continued on next page*)

Table 2 (*continued*)

Main theme	Subtheme	Description and occurrence
	Insufficient content knowledge/lack of preparation (1S)	Insufficient content knowledge is mentioned as hindering dialogicity. There is a lack of preparation to be able to confront, for example, student wonderment questions (S5)
Threads (6)	Misconceptions (3)	Dialogic and open approaches could lead to misconceptions (1, 1, 3)
	Wait time (2 = 1S + 1)	Extended wait time or use of time could lead to uncertainty among students and/or content not being covered (S2, 3)
	Repetition (1S)	Repetition is mentioned as forbidden in instruction (S2)
Other (64)	Content (25 = 20S + 4P + 1)	Focus merely on content without linking it to pedagogy or classroom interaction (S1, P1, P1, P1, S1, S1, S1, S1, S2, S3, S3, S3, S3, S3, S4, S4, S4, P4, S5, S5, S5, S5, S5, S5, 5)
	Additional (25)	Commenting on peers' comments or asking for clarification (e.g., "Was it a seventh graders' class?" (1, 1, 1, 2, 3, 3, 3, 3, 3, 4, 4, 4, 4, 4, 4, 4, 4, 4, 4, 5, 5, 5, 5, 5, 5, 5)
	Unspecified comment (14 = 4S + 5P + 5)	Includes unspecified comments about dialogic principles without further reflections (e.g., "Yeah, it was cumulative"; S1, 2, 2, P4, P4, P4, P4, S4) Also vague and irrelevant comments (e.g., "Dialogicity is hard"; "I cannot say exactly"; 1, 1, 2, S3, P4, S5)

required revisions of the themes and theme descriptions. The selection of the student utterances was a straightforward process, since in the online discussions with a limited number of participants the turns were taken systematically without overlaps. We acknowledge the importance of considering the role of the facilitator (second author). However, as the interviews followed a semi-structured interview technique (Kvale, 1996) with an open questioning approach, the student teacher responses were mostly about bringing in their observations and ideas on the plane of online discussion. Whenever needed, the facilitator probed for elaboration to stimulate further ideas (e.g., "What are your comments about the clip?"; "Any other notions?"; "What do you think about what he said?"). Some examples of themes and the chains of the discussions (including the facilitator) are addressed in the findings section. The results are presented through purposeful selection of examples consisting of distinct, repeating and otherwise interesting themes and features followed by researcher interpretations, which aim to further the understanding of the phenomena studied (Patton, 2015).

3. Results

We begin by reviewing the distinct trends in reflections and proceed by exploring in detail how student teachers shift from noticing challenges to reflecting on and providing suggestions to improve their teaching.

3.1. Dialogicity - the indicators, challenges and suggestions

Thus far, the findings (Table 2) reveal that student teacher comments did not restrict merely on noticing dialogic indicators (N = 72), rather they went further for providing suggestions toward more dialogic teaching (N = 75) beyond challenges brought up (N = 38). The online setting did not narrow the reflections to focusing merely on oneself; rather, it presented opportunities to consider systematically possibilities and suggestions on a joint level. For example dialogic indicators were pointed out 27 times from one's own lessons and 52 times from peer's lessons (see Table 2). Moreover, whereas student teachers noticed dialogic indicators from both their own and their peers' video clips, the challenges and suggestions mainly addressed their own teaching. Although only one reason for successful implementation was explicitly brought up, the student teachers were able to look forward in terms of facing the challenges through suggestions of more dialogic practices.

For instance, the most distinct findings reveal that often in addition to the level of noticing the distributed talk, the student teachers recognized its potential to enhance dialogicity (Group 3 as an exception). This was also highly linked to the student teachers' self-reflections; that is, suggestions for inviting more students and groups to take part in discussions were frequently (N = 11) brought up (note: the coded themes are indicated inside parentheses after the sentences addressing the theme).

Student teacher A of Group 1: "I was now wondering whether I could have inquired from the other students if they agreed or …" (SelfSuggestion: Distributed talk).

In contrast to the suggestion for distributed talk, students' passivity or silence were the most frequent challenges (N = 18) hindering collectiveness (e.g., "The class is usually very passive").

Another rivalry shown in the student teachers' reflections was related to open questions and questioning strategy:

Student teacher A of Group 4: In a way, we had some discussion going on there, but I quite closely said that "well, let's mark this inequality like this." Maybe I'm a bit overly self-critical, but I tend to leave the questions open or the discussion is left open. Like it goes nowhere. In a way, I was wondering whether there should be a clear open question or a clear closed question in order to avoid getting stuck somewhere between. Well, that's how I feel about the situation (SelfSuggestion: Questioning strategy).

This comment explicitly illustrates the student teacher's struggle between closed and more open questioning approaches, and the tension between authoritative and dialogic communicative approaches (Lehesvuori et al., 2019; Scott et al., 2006). As open

questioning was listed as one of the most observed implementation strategies (N = 11), this was also noticed and brought up quite often alongside noticing (N = 6) and suggesting (N = 10) follow-up turns with the aim of probing and seeking elaboration:

Student teacher B of Group 1: Yeah, if a correct answer was brought up, students still inquired why (PeerNoticing: Seeking elaboration/probing). Thus, the ideas were like coming from the students (PeerNoticing: Students' ideas considered). Like when Ann (note: all names are pseudonyms) was talking, it was more about repeating student responses (PeerNoticing: Repetition). So, it was not about having a monologue … this is how I see it.

In addition to noticing the students seeking elaboration, the student teacher noticed that student ideas were considered via repetition. Worthwhile to discuss, not always was repetition associated with dialogicity, but it was also pointed out as a thread by one student teacher:

Student teacher A of Group 2: There was, for example, one tutor teacher who said that you could not repeat what a student has just said (Thread: Repetition). Well, like, I was doing that in there (SelfNoticing: Repetition) … but the idea, in particular, was that we could continue the discussions based on that. I was trying to explain that to the tutor teacher.

While the student teacher notices the thread brought up by the tutor teacher in the after-lesson discussions, at the same time, she also notices her use of repetition from the clip and opens up the intention behind it: The reflected intention lines up with teacher repetition as neutral acknowledgement and recognition (Berland & Hammer, 2012, p. 75), often leading to extended dialogue and a kind of IRFRF-chain pattern (cf. IRPRP; Lehesvuori et al., 2018). Indeed, in the program, the power of repetition in relation to dialogicity was discussed, especially how repetition could be implemented when a student's voice is brought to the social plane of joint discussion. In contrast to monologue (as mentioned by student teacher B), dialogue involves heeding different voices, in this case, as elaborated by the teacher (Segal, Pollak, & Lefstein, 2017). The contradiction discussed might arise from the repulsion of behaviorism highlighted in teacher education during earlier decades.

3.2. The shift from challenges to providing suggestions and seeing possibilities for enhancing dialogicity

As pointed out earlier, the weight of student teacher reflection is on noticing dialogic indicators and providing suggestions to overcome the challenges associated with dialogicity and related strategies and approaches. The following example illustrates the shift from challenges to suggestions to improve teaching toward being more dialogic. The first example deals with student teachers from Group 2 in pre- and post-discussions of an example video clip:

(Before the clip) *Student teacher A of Group 2*: The goal was to be dialogic, but in my opinion, I wasn't that successful. I wrote it also in the form that I wasn't perhaps prepared enough that they did not begin the discussion, or I assumed that they would ask more questions or discuss more (SelfReason for unsuccessful implementation: Students/Class). I could have planned more about the nature of the questions, so there would have been more discussion (SelfSuggestion: Questioning strategy). I would like to add that also in the tutor teacher's opinion, this class is passive and they tend to be silent (conforms to above unsuccessfulness), but let's talk more about this after the clip.

(After the clip) Facilitator: Let's start with Mary's comments. What kinds of things did you notice?

Student teacher B of Group 2: Well, it came to my mind that Joselyn answered her own questions somewhat too quickly … she didn't wait that long before providing an answer by herself, although there were quite good pauses at times. Yet, occasionally, I noticed that perhaps Joselyn answered too quickly (PeerNoticing: Wait time). However, there were still many open questions and quite good questions actually (PeerNoticing: Open questions).

Facilitator: Yeah, the wait time. I did notice, too, that in some moments, there was an extended wait time, and in other moments, not that long a wait time … but actually, it increased the wait time when you told the pairs to think about the position of the line of height together.

Wait time was the second frequent (N = 11) indicator noticed and also brought up in the example exchange. Initiated by the facilitator mentioning the idea of pairs thinking about the position of the line of height together, student teacher A continues by bringing in suggestions for seeking elaboration ("Yeah, it was a good thing that I made students think in pairs. Then, if the solutions would have varied, then I could have inquired of the students, 'Why do you think like this? And, why do you like this?'") and the use of student responses ("By doing like that, I could have gained information about their thinking and use the students' ideas as a starting point for further discussions"; "Well, indeed, it would have been good if I had presented that this group has done it like this and this group like that. And from there, we could have proceeded to conclusions about which one is correct and finally pointing out that from both cases, there is the possibility to reach the correct solution"). Indeed, although the clock cannot be turned back, these suggestions to improve the student teacher's executed lessons are essential when looking forward to developing one's teaching and pedagogy to be more dialogic. Noticing the wait time (and the facilitator extending the description of the concept of wait time) not only helped student teacher A overcome the challenge of the students' passiveness/silence; it also shifted the focus on the students and their thinking and how to use it as a source for joint meaning-making.

While the previous suggestions are explicit in terms of engaging student thinking and then using the emerged ideas in joint discussions, in the next example, the student teacher from Group 4 is thinking about more open-ended approaches to present the task while commenting on a peer's lesson clip:

Student teacher B of Group 4: Sometimes when teaching this same class, I saw that Bob was raising his hand, but I also gave the others time to raise their hands (Self-Noticing: Wait time), yet many times, no hands were raised, so dialogicity is not that simple with this class (Challenges: Class) … anyway, the same elements were there that were in the other lessons, that the task is built together with the students (Noticing: Distributed talk/Shared responsibility). The only thing that came to my mind on the fly is if the task could have been presented in a way that the bits and pieces would have been collected jointly. Like with what age Mary could have been marked,

and what were the other names? That the preconditions would have been explained, that they can be this age maximum, and students would have been given some minutes to think about how to formulate the equation (Suggestion: Alternative representation of the task – open approach).

The turn begins with the student teacher reflecting on his experiences with the same class and his attempts to give other students space to contribute to the discussion via an extended wait time, despite one student's efforts to take the floor. Although the student teacher is not very detailed regarding challenges with dialogicity, he explicitly names the class hindering it. He, however, notices that there was shared responsibility for the formulation of the task (with the distributed talk theme). While the previous reflections have been on noticing, now the student teacher takes his reflections further to consider how the task could have been introduced more openly in order to stimulate student thinking and participation. This brings us back to the shared responsibility and ownership of the task ("students would have been given some minutes to think about how to formulate the equation"). The reflection not only addresses content; it also contains a functional meaning for engaging students in more meaningful and dialogic interactions. Offering similar suggestions was characteristic of the student teachers in Group 4 (N = 15 times out of total N = 26), who balanced the challenges with the possibilities that accompany dialogicity. This balancing is evident in previous reflection examples. Applying a more open-ended approach to the presentation of the tasks is the most frequently delivered strategy to enhance dialogicity in the classroom (see Table 2).

4. Discussion

The aim of this study was to explore student teachers' reflections on features of classroom interactions that enhance dialogicity in mathematics lessons during their teaching practices. The findings reveal that the possibilities and suggestions outweigh the challenges and reasons for unsuccessfulness. This is a remarkable difference from some previous teacher education programs, which found it difficult to shift from challenges to suggestions for moving toward more dialogic teaching (Lehesvuori et al., 2011a, 2017). More specifically, although in previous programs student teachers were able to experience successful dialogic teaching episodes, the weight of reflections were majorly on challenges rather than seeing possibilities or bringing in suggestions. The overview suggests a considerable shift from surface-level self-reflections and noticing to more in-depth reflections on developing one's own professionalism through adoption of observation-based protocol for classroom interactions and dialogicity (cf. Hafen et al., 2015). The shift from challenges to suggestions in this study was present in the student teachers' examples in which the challenges were left behind while the student teachers began to draft ideas of seeking elaboration, using student responses, and implementing alternative presentations of the task with a more open approach. Especially the tasks with link to students' real world experiences, such as Minecraft (Group1, Clip2 in Table 1) and Winnie the Pooh (Group5: Clip1 in Table 1), hold in the potentiality for dialogic interactions through shared ownership (Lehesvuori et al., 2018). In other words, while the openness for everyday views and experiences is in-built, there is a possibility for student higher engagement in discussions.

As discussed in some previous studies (Sherin, 2002), the challenges and related suggestions were often linked to finding a balance between open and directed discussions. And, in relation to the findings of this study, finding a balance between open and closed questioning (i.e., challenges in the questioning strategy). At the same time, more implicitly, this addresses the issue of the tension between authoritative and dialogic approaches (Lehesvuori et al., 2019; Scott et al., 2006), and how teacher-orchestrated discussions are rhythmed and strengthened by using different communicative approaches. In the student teachers' case, linking the teaching purpose (Mortimer & Scott, 2003) to the task at hand would make choosing a specific questioning strategy much easier. That is, planning the teaching purpose of a specific episode within a lesson and linking it to an appropriate communicative approach would rationalize the use of strategies involved in dialogic approach, such as open questioning, before moving to an episode orchestrated via a more authoritative approach (Mortimer & Scott, 2003). Of course, the challenging balancing act comes along with the transition phases when moving from opening up to closing down (Lehesvuori et al., 2019). In mathematics (as well as in other subjects) the challenge is how to proceed from students' ideas and experiences to more mathematical expression of phenomena.

In terms of the intended dialogicity, the challenge was how to make the most of open-ended questions and their potential to engage students in extended and meaningful dialogue. The simplest remedy to this challenge was the explicit suggestion of extended wait time. Despite being a rather vivid suggestion, wait time has been found to be very infrequent and challenging, especially in whole-class discussions (Lehesvuori et al., 2013). While wait time has been found very efficient in breaking the transmissive modes of classroom interaction dominated by IRF- patterns to more extended dialogues, the use of extended wait time may be challenging (Ingram & Elliott, 2016). In relation to the pressure caused by curricular demands and getting it right, wait time was also (infrequently) seen as a challenge and a thread for fluent and topic-related discussions (Bilaloğlu, Arnas, & Yaşar, 2017).

Although it seems that subject content played an important role in reflections, this theme was mostly addressed when the student teachers introduced their video clips to be observed in terms of setting the conceptual context. Nonetheless, linking the content to the reflections is, of course, natural, even essential, as the reflectors and facilitators are specialized in mathematics education. According to Murphy (2006), teachers' subject knowledge should be at a high level in order to be able to present mathematics in various ways to address students' thinking and misconceptions. Assuming this is the case among this study's student teachers, linking their subject knowledge to dialogic approaches stems from reflections on PCK (Shulman, 1986). This is a more sophisticated form of reflection, going beyond noticing indicators or reflecting on singular features of classroom interactions toward elaborating on how to take student thinking further (Lehesvuori et al., 2011a, 2011b; Hill, Ball, & Schilling, 2008). This is also at the heart of subject teacher training, whereby student teachers should acquire tools to orchestrate meaningful learning of mathematics while reflecting on issues addressing PCK (Kilic, 2018a). An essential aspect in developing teacher PCK is helping teachers realize that students have pre-existing ideas and experiences, and it is important to look for these systematically by actively listening and probing for them (Schneider & Plasman, 2011). In other words, shifting the focus on students and their ideas should be emphasized (Amador, 2016).

Based on the findings thus far, the program could be considered successful in helping student teachers take the next step toward more dialogic teaching in mathematics. Despite the challenges and the reasons raised for unsuccessful implementation, the student teachers were able to take a step toward reforming the prevailing authoritative classroom interactions (Lehesvuori et al., 2013; Mercer et al., 2009). While in some previous teacher education programs, challenges associated with dialogicity have remained at a general level, addressing themes such as insufficient content knowledge, disciplinary issues, and a lack of time to cover the curricular content (Lehesvuori et al., 2011a), in this study, these were rarely mentioned if at all. Furthermore, challenges were discussed with the intention of seeking ways to encounter them in future service. The dialogic indicators noticed in the video clips indicate success already in preservice training; thus, student teachers have a good chance to keep on noticing and developing their communicative skills while in service (Wiens et al., 2020). Indeed, the next step relates to how beginning teachers could notice and reflect-in-action in terms of making in-the-moment decisions that facilitate learning (Jacobs, Philipp, & Sherin, 2018).

It has become even clearer that when introducing principles of dialogic teaching in preservice teacher training programs, such as those in this study, educators should acknowledge the gap between ideological dialogism and classroom realities (Lefstein, 2010). That is, the main message should be about heading toward increasing open dialogue, rather than reaching an ultimate point (Wegerif, Boero, Andriessen, & Forman, 2009). The findings in this study suggest that the student teachers did not only notice indicators that take the interaction in a more dialogic direction, but they also considered ways to be more alert to invite students to join discussions and to seek elaboration for the sake of extended dialogue. Most of all, the student teachers were able to see the potential of the tension between the subject of mathematics and educational dialogue as fuel for more meaningful discussions initiated through an open approach when presenting mathematical problems. In other words, the student teachers were able to see the subject and content not only as a contextual challenge but also as a resource for dialogicity and, thus, for meaningful teaching and learning.

5. Limitations and conclusions

Although the online discussions were not planned when outlining the teacher training program, they proved to be efficient for facilitating joint reflections. Even if some authenticity of the group discussions was possibly lost in the structured turn-by-turn commenting, the discussions still often fueled chained interactions between the student teachers. It was noticed that during the online reflections, even more extended wait times were justified and were also used by the facilitator, forcing the student teachers to take the lead and be active. In onsite group discussions, the spectrum of active participants could be wider, and some participants could dominate the discussions while others remain silent.

Deriving from the findings, future research could address more explicitly what kind of open-ended tasks could be designed in terms of striking the balance between dialogicity and mathematical content. Furthermore, when it comes to the orchestration of meaningful interactions, careful scrutiny of the transition phase from dialogic (opening up) to authoritative (closing down) could provide new information about achieving and maintaining the balance between different forms of interaction (cf. Lehesvuori et al., 2019).

While we have presented selected examples of mathematics student teacher reflections within a certain program, we are not able to draw further conclusions about sustainability or generalizations, especially when it comes to the success of future implementations of dialogic approaches. It has been discussed that teachers would need ongoing support during their early years in teaching in order to prevent them regressing back to more teacher-centred and authoritative approaches (Lewis, 2014). While the key to successful praxis needs to be studied further, the role of a long-lasting, systematic, and cyclic process of knowing, seeing, doing, and reflecting (Hamre et al., 2013), supported by theory-based and structured forms for observing and reflecting, cannot be neglected (Bennett, 2010). This is evident by the student teachers' reflections and verbalizations regarding the adoption of the dialogic indicators and related concepts. Finally, the student teacher's confidence in challenging the tutor teacher in the incident of repetition exemplifies the seeding of the sociocultural approach and dialogic principles in teacher education. Although singular, it is still an explicit nuance when it comes to the possible influence of dialogicity and the continuous need for reforms.

Declaration of competing interest

None.

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