From pre- and in-service teachers' asymmetric backgrounds to equal co-teaching: Investigation of a professional learning model

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The existing co-teaching practices in teachers' professional learning emphasize collaboration between pre-service and in-service teachers. Although this collaboration is usually defined by a mentor–student relationship with asymmetric power relations, successful co-teaching practices in schools are considered to involve parity, resulting in mutual learning for all involved parties. In this study, we designed a model for teachers' professional learning in which pre- and in-service teachers collaborate and have shared goals, with the aim of equal responsibilities for planning and implementing instruction, despite the teachers' diverse backgrounds. During the 4 years of piloting and developing the model in the Finnish teacher education context, we investigated how the participants reflected on the co-teaching process. We analyzed data from collaborative reflection sessions to identify the challenges and benefits of this untypical form of collaboration. The findings showed that asymmetric backgrounds may cause challenges, but that if these are overcome, they can also create opportunities for valuable co-teaching experiences for all the participants. Helping the participants initiate the co-teaching process and take different roles appeared to be essential for a successful process. We discuss the findings regarding the development of co-teaching practices in teacher education and in schools.

KEYWORDS

co-teaching, in-service teacher training, pre-service teacher training, teacher education, collaboration

Introduction

Attempts to develop schools and make them collaborative learning environments have resulted in a growing interest in co-teaching and teachers working in teams. In brief, co-teaching is defined as two or more teachers planning, instructing, and evaluating together (Bacharach et al., 2010). It has been suggested that collaborative ways of teaching provide students with better learning opportunities and outcomes than having solo teachers (Bacharach et al., 2010; Faraclas, 2018; Antinluoma et al., 2021), and that co-teaching makes the atmosphere more positive (Strogilos and King-Sears, 2019) and increases students' affective engagement (King-Sears and Strogilos, 2019). However, despite the promising results in terms of student learning and teachers' professional development, several factors appear to be challenging in co-teaching. One challenge is related to unequal power relations and unattainable parity among different co-teachers. A lack of shared authority and responsibility is considered to impede collaboration, the development of trust, and the effective implementation of teaching, especially in mentor teacher–pre-service teacher relations during teaching practice periods (Baeten and Simons, 2014; Rabin, 2020), but also in different co-teaching settings in schools (Hargreaves, 2002; Pratt, 2014; Jurkowski and Muller, 2018). The development of successful co-teaching practices in which the participants share authority and engage evenly is likely to take a great deal of time and effort, particularly in terms of planning and designing the co-teaching process (Bacharach et al., 2010; Rytivaara et al., 2019; Alabdallat et al., 2021; Antinluoma et al., 2021).

This study addresses the challenge of sharing authority in co-teaching by focusing on collaboration between in-service and pre-service teachers. Gaining experience from co-teaching is considered important during both teacher education and professional learning programs (Scantlebury et al., 2008; Faraclas, 2018). Although shared responsibility and parity appear to be prerequisites for successful co-teaching (Hargreaves, 2002; Strong and Baron, 2004; Pratt, 2014), in-service teachers and pre-service teachers seem to lack opportunities to practice co-teaching process with this emphasis. Even when a more equal approach is taken in teaching practice periods and mentor teachers are encouraged to attempt to share authority and learn from pre-service teachers, they tend to maintain their mentoring roles (Rabin, 2020). The ways in which to cope with the asymmetric backgrounds and inequal power relations of co-teaching during professional learning activities remain poorly known.

This study explored the challenges related to co-teaching that arose and how they were coped with during a professional learning project piloted in the Finnish teacher education context (Kervinen et al., 2016; Havu-Nuutinen et al., 2019). In the designed model, pre-service teachers and in-service teachers were encouraged to strive for equal collaboration despite their

different backgrounds. Our hypothesis was that acknowledging and building on the different expertise of the participants (such as the in-service teachers' longer work experience and the pre-service teachers' up-to-date ideas of classroom activities) would enable the presumably imbalanced collaboration to move toward parity among the collaborators, something that is considered to be characteristic of successful co-teaching teams (Strong and Baron, 2004; Rytivaara et al., 2019; Rabin, 2020). Whereas co-teaching often involves some form of team teaching—several teachers simultaneously teaching in the classroom—designing and evaluating the classroom activities and reflecting on the whole process together are considered important prerequisites for a successful process (Bacharach et al., 2010; Rytivaara et al., 2019). In this study, we focused on how the participants coped with such asymmetric backgrounds when collaboratively planning the teaching and reflecting on the collaboration. Our aim was to understand how the goal of equal collaboration and shared authority in co-teaching can be advanced in general, and through a professional learning program design in particular.

Co-teaching practices in schools and in teacher training

Curricula are increasingly encouraging schools to develop co-teaching practices. For example, the Finnish national core curriculum for basic education states that "the collaboration between adults, such as simultaneous co-teaching, models how school functions as a community also for the students" (Finnish National Board of Education [FNBE], 2016). Co-teaching is considered a collaborative way of working that helps teachers improve their work and provides students with good learning opportunities and increased opportunities to support diverse learners (Bacharach et al., 2010; Faraclas, 2018; Antinluoma et al., 2021; Rytivaara et al., 2021). Rytivaara et al. (2021) suggest that co-teaching is becoming an increasingly important means for teachers to cope with the various professional challenges in their work. Students, in turn, seem to enjoy the good relationship between the co-teachers and the safe and positive atmosphere in the class (Strogilos and King-Sears, 2019). Co-teaching covers the whole pedagogical process: planning, teaching, and assessing together (Bacharach et al., 2010).

Successful co-teaching requires effective co-teacher planning and maximizes instructional effectiveness and student participation in the classroom. The communication between co-teachers is open and responsibility is shared, and co-teachers are able to agree on classroom structures, routines, and behavior management (Faraclas, 2018; Jortveit and Kovač, 2021). According to Pratt (2014), a successful co-teaching relationship has three phases. During the initial phase, teachers may decide together to start co-teaching based on shared interests or needs stemming from the students, or the authorities may encourage

them to cooperate. During the collaboration phase, teachers learn to work together. They switch roles flexibly in class and complement each other. During the third phase, the practices are established, and the teachers learn to lean on each other's expertise. Pratt (2014) argues that compatibility can be achieved by being similar or complementary, and that in an effective co-teaching state, teachers are interdependent of each other. Strogilos and King-Sears (2019) raise the requirement of equal distribution of responsibilities in co-planning as the best way to respond to students' needs and to evenly distribute teaching responsibilities. In contrast, differentials in power relations can hamper negotiations, sharing feedback and mutual learning between the collaborators (Strong and Baron, 2004). Reflection is therefore a central part of co-teaching. Teachers reflect on their roles, learning objectives, content, and practices (Rytivaara et al., 2019).

Pre-service teacher co-teaching and collaboration with in-service teachers is considered an important part of current teacher education (Kimmelmann and Lang, 2019; Rabin, 2020), but also a professional development opportunity for in-service teachers (Bacharach et al., 2010; Faraclas, 2018). To learn proper co-teaching skills, Bacharach et al. (2010) suggest that pre-service teachers and in-service teachers (or mentor teachers during the teaching practice period) should teach together and practice strategies of shared authority and consistent engagement of the parties involved. In such reciprocal collaboration, pre-service teachers can bring fresh perspectives to class, and in-service teachers can provide critical support in putting ideas into practice (Rabin, 2020).

Yet, collaboration between in-service and pre-service teachers is characterized by power imbalances, as the in-service teacher is expected to be a mentor who evaluates the candidate's performance (Stang and Lyons, 2008). Achieving parity and practicing collaboration with equal responsibilities is particularly difficult in such a setting. Collegiality tends to be affected and superficial while tensions remain under the surface (Hargreaves, 2002; Strong and Baron, 2004). Although reciprocal observations and feedback could provide all collaborators with the opportunity to learn from teaching (Darling-Hammond and Baratz-Snowden, 2007), many studies have reported that teachers fail to build such relationships (Murawski, 2009; Pratt, 2014). Pre- and in-service teachers are not necessarily ready to operate together, do not have the experience, or have not mastered sufficient models to make it work. Permanent co-teaching practices necessitate proper relationship building, which in turn takes time (Rytivaara et al., 2019; Alabdallat et al., 2021; Antinluoma et al., 2021).

Although existing studies have focused on the challenges in the mentor–candidate relationship, few studies have explored practices that explicitly aim to support parity between pre-service and in-service teachers. In a study of a long teacher preparation program, Rabin (2020) found that acknowledging the power imbalance between mentors and teacher candidates

and supporting the dialogue between the two is a necessary starting point for equal forms of collaboration. In this study, we approached the challenge of parity by trying to dismantle the mentor–candidate relation altogether, which the specific professional learning context (not compulsory teaching practice) made possible. In our model, the collaborating pre-service and in-service teachers shared the goal of planning and implementing an integrative science and mathematics learning module with no requirement to evaluate each other's performance. Studying the experiences of such collaboration leads to an understanding that can be applied to a variety of co-teaching settings and to developing professional learning from them, including mentor–candidate-oriented teacher training.

Context of the study

This study was situated within a professional learning program that was developed and implemented in the teacher education department of the University of Helsinki. In this section, we provide the background to the study by first briefly describing the essential characteristics of Finnish teacher education and then the designed professional learning model.

Finnish teacher education system

The goal of teacher education in Finland is to provide pre-service teachers with skills to become autonomous, self-developing professionals (Krzywacki et al., 2015). In part, this stems from the educational policy system, which has no teacher evaluation system at the national or regional level. Instead, teachers are expected to act ethically and professionally by being self-reflective, supported by their own education and an effective education system (Krzywacki et al., 2015).

Finnish teacher training lasts 5 years: The bachelor's degree is obtained in the first 3 years and the master's degree in the last 2 years (refer to Niemi et al., 2016). The studies include two 5- to 7-week teaching practice periods that are usually spent in university teacher training schools. During the teaching practice periods, pre-service teachers typically work in teams of their own and practice both solo teaching and co-teaching. A mentor teacher from the teacher training school supervises the students. The professional learning activities on which this study focused were not part of the pre-service teachers' teaching practice periods. Instead, the co-operation was with local schools, the pre-service teachers were not assessed, and the overall goals were different from teaching practice, as described in the next section.

Combining practical knowledge and educational theory effectively in teacher education is challenging (e.g., Stürmer and Seidel, 2015). Pre-service teachers must be given sufficient information to implement the school curriculum, but at the same time also be able to try out how theoretical knowledge

functions in the practice of teaching (Toom and Husu, 2018). In the professional learning model on which this study focused, pre-service teachers have the opportunity to collaborate with in-service teachers from local schools.

The developed professional learning model for co-teaching

The study was part of a teacher professional learning project—-the STEM Ambassadors—-which was conducted in 2014–2017. This study used data from six cycles (one in the spring and one in the autumn term) in 2015–2017. The project was built around a co-teaching model, in which two to three pre-service teachers, two to three in-service teachers from the same school, and a teacher educator formed a team, and collaborated in planning and implementing a teaching module (6–12 STEM-related multidisciplinary lessons) in a school (refer to Kervinen et al., 2016).

One major aim of the project was to develop the participants' co-teaching skills. Evolving from the idea of shared expertise, the rationale behind the model was that pre-service teachers and in-service teachers have different strengths in the process (e.g., Rabin, 2020). Pre-service teachers have recent knowledge and ideas concerning inquiry-based and integrative learning activities from their university courses (which have followed the recently updated national core curriculum) as well as those provided by the teacher educators during the orientation phase (refer to Figure 1). In-service teachers, in turn, have expertise in everyday school practices, student groups, and suitable pedagogical approaches (Havu-Nuutinen et al., 2019). The teacher educator member of the team facilitates and supports the team with ideas and current knowledge and provides material and resources from the university. In this way, all the members of the team make a valuable contribution to the co-teaching process. The shared goals for the teaching module were emphasized to make visible the different kinds of expertise and contributions that extend beyond the mere amount of teaching experience. Thus, the collaboration between in-service and pre-service teachers was guided toward the kind of dynamic co-operation that exists between novices and experts, instead of being a relationship between a mentor teacher and a pre-service teacher that appeared during the teaching practice periods. The teacher educators explicated the goal of co-teaching with equal contribution at the beginning of the process and later reminded the participants of it, and time was allocated for collaborative planning throughout the process. Figure 1 summarizes the phases of the designed co-teaching model.

Each cycle began with a 4-h orientation meeting of all the teams. The in-service teachers were asked beforehand for any possible wishes or limitations concerning the learning module theme, as each module had to align with the school's curriculum. During the orientation, the goals of the STEM

Ambassadors project, the guidelines for co-operation, and the time schedule were presented. The participants were introduced to the goals of subject integration in teaching and the inquiry approach in science and mathematics teaching, both of which the team members were encouraged to pursue when planning the teaching module. During the first two cycles, the pre-service teachers met separately for 2 h before the in-service teachers joined the teams. The aim was to refresh their memories about the central aspects and practices of the inquiry approach in teaching. In the subsequent cycles, the model was developed, so that the in-service teachers were also present from the very beginning. This was to avoid situations in which pre-service teachers would already begin to plan the activities without the in-service teachers' effort. Despite removing the separate orientation phase for the pre-service teachers, their competence in contributing to inquiry science and mathematics activities was supported by the teacher educators by referring to past course material and providing additional instructional material from past cycles during the process. In the orientation meeting, the teams also began to plan their module, time schedule, and distribution of work. Next, the teams held 2–3 planning meetings according to their needs and implemented a teaching module in the school. At the end, all the participants gathered to share their experiences and discuss what had been successful and what could be improved.

During the collective 2-h reflection meeting, each team briefly introduced their teaching interventions, and this was followed by an organized discussion on the themes and goals of the project. First, the realization of the inquiry approach and subject integration in the teaching module was discussed. After this, the participants shared their experiences of the successes and challenges of co-teaching practices and discussed how the model could be further improved to support the development of co-teaching skills. In this way, the reflection followed some of the aspects regarded as important for a successful reflection process: Sharing the interventions helped the participants relive their past experiences, after which they discussed the chosen themes collaboratively (refer to Rodgers, 2002). The reflection was not strictly structured and, depending on the issues that the participants raised, the goals of co-teaching were emphasized more in some cycles and less in others. In accordance with both the phases of co-teaching (Bacharach et al., 2010) and the process of reflection (Rodgers, 2002), the thoughts that arose in the reflection meeting were used for further developing the co-teaching model and served as the next experiences for the participants from which learning could continue (refer to Figure 1).

Materials and methods

To analyze the characteristics of the co-teaching process, we drew from data on the different co-teaching members' joint
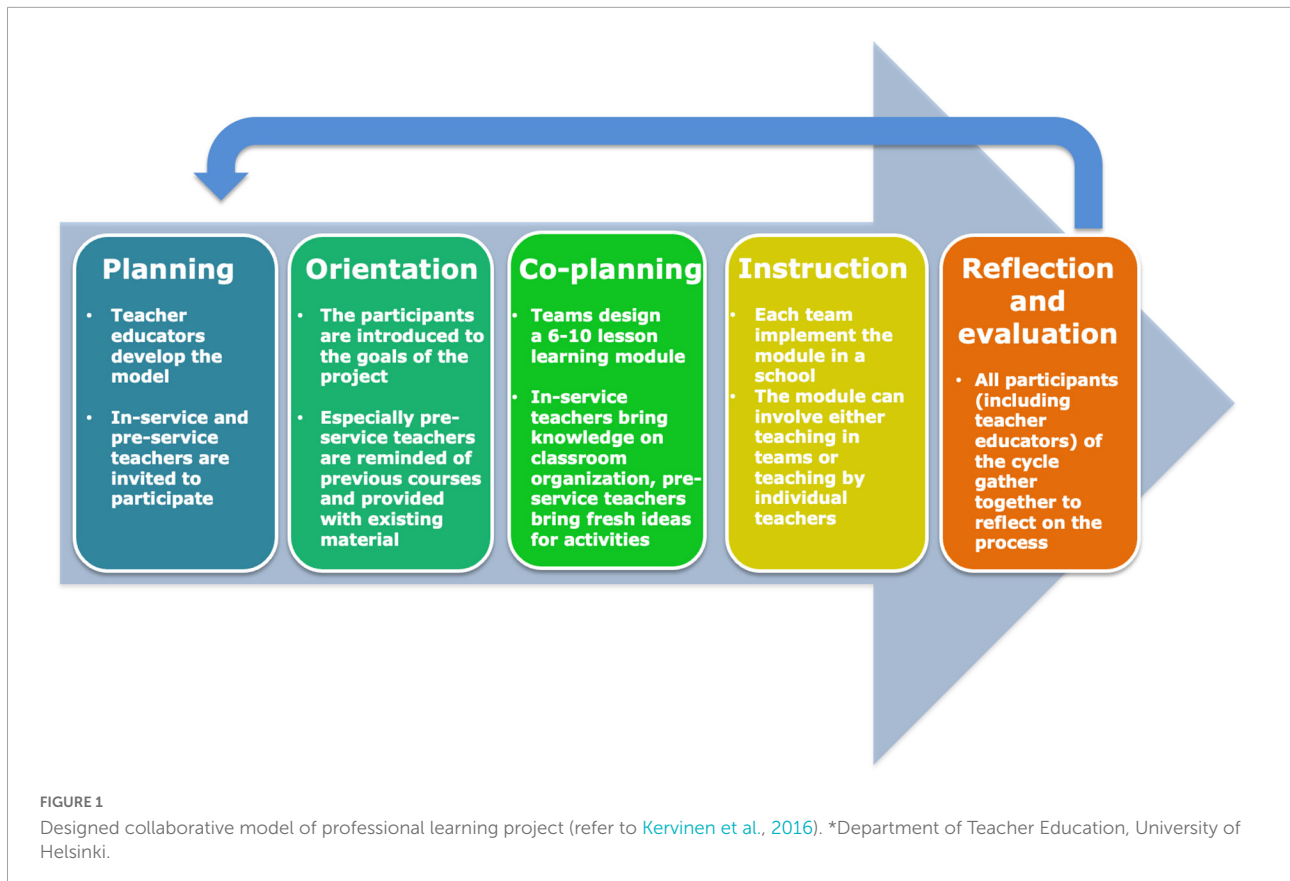
reflections. The pre-service and in-service teachers participated in a professional learning project the aim of which was, instead of mentoring the pre-service students, equal collaboration among the participants. The research question guiding the study was as follows: "What kind of challenges related to equal collaboration and organizing co-teaching did pre-service and in-service teachers reflect on at the end of the co-teaching process?"

Participants

In total, 40 primary and 9 secondary pre-service teachers, 28 in-service teachers, most from elementary schools, and 7 teacher educators participated in the project (Table 1). During the six cycles, altogether 18 teams were formed. The participants were asked to indicate their interests regarding science contents, and these wishes were considered during the team formation. Each team planned a STEM-related multidisciplinary teaching module (6–12 lessons) to be implemented in the local school and worked together from 4 to 9 weeks in total. Each team consisted of two to three in-service teachers from the same school (except for once, when the team had only one in-service teacher), two to three pre-service teachers, and one

teacher educator. In total, two pre-service teachers and nine in-service teachers participated in more than one cycle based on their willingness, most of them two times. All the participants applied on a voluntary basis. The pre-service teachers were in their third or fourth year of study. By participating in the project, they obtained credits for some assignments of their mandatory or voluntary courses. Whereas all the pre-service teachers participated in the reflection meetings, altogether 7 (out of 28) in-service teachers could not attend the reflection meeting due to unexpected time constraints. However, at least one of the in-service teachers of the team was typically present, and only once (in the fall of 2017) did one team completely lack in-service teachers in the reflection session.

Data collection and analysis

The data used in this study comprised video and audio recordings of the collective reflection meetings at the end of the cycles. The reflection data were gathered from six cycles (refer to Table 1). Focusing on the reflection meeting for data acquisition was beneficial as it was an authentic phase of the co-teaching process itself; the reflective accounts of the participants' experiences can be considered not only past memories, but also

TABLE 1 Study participants during the six cycles.

Year	Participants	Teams	School level
2015S	14 pre-service teachers 10 in-service teachers 3 teacher educators	4 teams	Elementary
2015A	5 pre-service teachers 3 in-service teachers 3 teacher educators	2 teams	Secondary
2016S	9 pre-service teachers 8 in-service teachers 3 teacher educators	4 teams	Elementary
2016A	8 pre-service teachers 6 in-service teachers 2 teacher educators	3 teams	Elementary
2017S	9 pre-service teachers 6 in-service teachers 3 teacher educators	3 teams	Elementary
2017A	6 pre-service teachers 4 in-service teachers 1 teacher educator	2 teams	Elementary Secondary

accounts of the ongoing co-teaching process of the designed model.

The audio recordings of the reflection meetings were transcribed for the analysis. In this study, we focused on the parts of the approximately 2-h long discussions that concerned co-teaching, mostly excluding the parts that discussed the goals of the inquiry approach or subject integration. Although the six reflection meetings varied in terms of what was discussed the most, they all included from 30 to 50 min of discussion on co-teaching experiences. The data were analyzed using thematic analysis to identify and report patterns in the success and challenges of co-teaching (Boyatzis, 1998; Braun and Clarke, 2006).

First, we searched for all the fragments that related to co-teaching in the data. The first four authors then coded these fragments with initial codes that summarized their content, then discussed, and agreed upon the coding. The analysis units varied from one to several sentences within one participants' utterance, in addition to which the context of the utterance was deduced from the previous dialogue when needed (e.g., when answering a question). The analysis focused on the semantic content of the utterances, that is, on the expressed perceptions of the co-teaching process. However, in the analysis, we also sought to identify the underlying assumptions and conceptualizations in the participants' speech, which Boyatzis (1998) refers to as analyzing themes at a latent level.

Based on the iterative discussions on the larger themes to which the codes related, the codes were sorted into relevant themes and subthemes. Each of the first four researchers then reviewed and revised the themes by comparing them with the data segments to assure their integral and external homogeneity. When the researchers all agreed on the iterative revision, the themes were named and interpreted according

to the research question. In this report, to increase the transparency of the analysis, we present the findings using demonstrative data excerpts.

Results

This study focused on how pre-service and in-service teachers reflected on a co-teaching process when the aim was an equal collaboration between the participants despite their asymmetric backgrounds. In this section, we describe and analyze two identified themes through which the participants reflected on the prerequisites of the successful co-teaching process: (a) how negotiating and discovering various co-teaching roles simultaneously challenge and support the aim of equal collaboration (i.e., failing to share responsibilities equally, benefitting from different roles); and (b) how institutional and practical requirements and barriers (i.e., appreciation of having several teachers, lack of time, curricular demands) may hamper co-teaching. It was common that within the same cycle, the experiences of the different teams varied, which led to both the positive experiences and challenges being reflected on together. Moreover, the design of the co-teaching model was gradually developed based on the reflection and feedback, which resulted in more challenges occurring in the early cycles than in the later cycles. Overall, we found that although the asymmetric background of the participants may have caused challenges, once overcome, they could create opportunities for rewarding, instructive co-teaching experiences.

Negotiating roles and responsibilities in co-teaching

The acknowledgment and negotiation of roles between the pre- and in-service teachers manifested in two ways. First, the participants reflected on the occasions on which the sharing of responsibilities between the different participants had not worked as well as expected or desired. Second, the participants reflected on the benefits and successful practices of taking different roles according to different backgrounds.

Failing to share responsibilities equally

The beginning of the co-planning appeared to be a particularly important phase for negotiating equal roles in the team. In some teams, and especially in the early cycles of the project, the beginning of co-planning was experienced as difficult or unsuccessful in terms of the aim of equal roles for the pre- and in-service teachers. During the first cycles, the pre-service teachers met separately before the in-service teachers joined the teams, which led some teams to experience difficulties in taking roles that would benefit equal co-planning. Providing pre-service teachers with knowledge and new ideas to

be implemented—-the rationale behind the diversified start—-served this purpose, but simultaneously hampered equal collaboration, as the following quote shows:

> In a way, there are two perspectives. On the one hand, it's nice to bring in something fresh and new. But on the other hand, are you being left alone to do these fresh, new things, or do you do it together with the in-service teacher? (2016S, pre-service teacher).

Some of the in-service teachers also considered that meeting the pre-service teachers right away would have given them more opportunities to contribute to and participate in the planning:

> It would have been easier as a teacher, too, to have that kind of opportunity to come up with ideas. So that you could work on it by yourself more and think what you could bring in. Now it was a bit like, there are experts and then there's us, the teachers, when we first met (2015S Teacher).

As said, this uneven effort in the planning and coming up with ideas for teaching arose at least partially from the diversified beginning of the project in the early cycles. However, it was not only the setup of pre- and in-service teachers planning on their own that hampered collaboration, but also the expectations and inadequate commitment of some in-service teachers. The following excerpts show how some pre-service teachers expected an equal share of responsibilities and wanted the in-service teachers to take a more active role from the early stages of planning to the actual collaborative teaching in the classrooms: "The starting point of the in-service teacher was a bit wrong. They thought—wonderful, we get the students here." (2016S, pre-service teacher):

> The in-service teachers somehow thought that we would plan and do, and they would just tell us what they have to offer. No more participation than that. It should be emphasized more that this is specifically about teaching together (2016S, pre-service teacher).

The excerpts show that, despite the announced goal of equal distribution of responsibilities and equally important roles, some of the in-service teachers considered the collaboration to primarily involve receiving new insights and fresh ideas from the pre-service teachers while not contributing as much themselves. The pre-service teachers were disappointed by such roles and wanted more effort from the in-service teachers, also during the actual teaching. Some pre-service teachers even occasionally felt that the in-service teachers were evaluating them, as if it was the teaching practice period. This was perceived as being contrary to collaborating as a team, as the following excerpt shows:

> I at least was troubled to realize that the teacher stepped back as a complete outsider and observed, as if it was a practice lesson. And then said that, hey, this went well. At that point, I felt that we weren't a team (2016S, pre-service teacher).

The in-service teachers' evaluation was also apparent in their own comments. The following excerpt exemplifies how the in-service teachers took an evaluative stance even during the reflection meeting, albeit in a positive tone: "When someone [a pupil] asked could it be done this way and what do you think, you handled that side really well. Actually, I admired it" (2017S, in-service teacher).

After the first cycles, the goal of equal responsibilities and roles in both planning and teaching was more heavily emphasized to the in-service teachers before they were invited to participate. Consequently, in the subsequent cycles, the feeling of failure in this regard did not arise nearly as often as during the first cycles.

Benefitting from different roles

Although the differentiation of roles between the pre- and in-service teachers was evaluated from the standpoint of failure to share responsibilities equally, at the same time, many participants also acknowledged the benefits of different backgrounds and taking different roles. In this respect, the different backgrounds and different responsibilities were not perceived as a hindrance but as a benefit. In general, many participants greatly appreciated the experience of successful collaboration in a diverse team, as summarized by one pre-service teacher: "I think one of the best things in this project is that you really start to do it together" (2017S, pre-service teacher).

One goal of the applied co-teaching model was to encourage and support pre- and in-service teachers to learn from each other and from what they do together at schools (c.f. Rabin, 2020). In this respect, many pre-service teachers reported positive experiences of successfully co-teaching and sharing responsibilities with in-service teachers, who were familiar with the students and common practices: "We didn't need to worry about anything other than our own part. The teachers ensured that everything else was taken care of. We could just concentrate on what we were doing." (2016A, pre-service teacher):

> In the first lesson, [the teacher] introduced the whole project so that the pupils were on kind of safe ground. So that first their own teacher was in charge and told them that soon the pre-service teacher would continue. Instead of the teacher just being like—here's the classroom, I'm going to have a coffee (2017S, pre-service teacher).

The excerpts show how the pre-service teachers gladly accepted their role of "doing their own share," and that the

in-service teachers took care of organizational issues and supported working with students with whom they were familiar. In addition, the participants appreciated the arrangements according to which the responsibilities for co-teaching were clearly shared with the in-service teachers, as exemplified in the following excerpts: "Then we shared the responsibilities. We all had 1 day of lessons to take care of. But then we still discussed the ideas everyone had and developed them further" (2017S, pre-service teacher); "It was mutual trust, at least for me. A kind of feeling that at no point had anyone become a bystander. We considered you [pre-service teacher] a richness" (2017S, in-service teacher).

Sharing responsibilities were perceived as particularly beneficial in terms of the different strengths of each participant. As the following excerpts exemplify, this is related not only to the collaboration with experienced in-service teachers but also to that among the pre-service teachers: "It was definitely a strength; you couldn't do that alone. [...] Everyone had their own strengths." (2017S, pre-service teacher); "I think it really trains you to become a teacher when you get an example from the school and, at the same time, pre-service teachers can come up with new ideas." (2017S, pre-service teacher).

The in-service teachers also found benefits in collaborating with the pre-service teachers who had new ideas and put effort into implementing them. The following excerpt shows how the in-service teachers appreciated how the successful collaboration enriched teaching, but they simultaneously stressed the reciprocal nature of the relationship.

> I think this was a complete win-win situation. The pre-service teachers have some new activities and from us [in-service] teachers they get an understanding of everyday school practices (2015S, in-service teacher).

Coping with the institutional framework

The second identified theme through which the participants reflected on the co-teaching and its success related to the institutional resources and requirements that either supported or hampered the collaborative process and its equality. Some specific institutional barriers could potentially be overcome through successful co-teaching practices, whereas others complicated the collaboration. In terms of aiming for equal collaboration between pre- and in-service teachers, certain institutional and organizational factors appeared particularly important.

Appreciation of having several teachers

Having several teachers (pre- and in-service) to organize the teaching was perceived to be one of the major benefits

of co-teaching. It was appreciated by both the pre-service and in-service teachers and resulted in increased effort in working together. Moreover, some of the activities could not have been conducted alone, as mentioned in the following quotation: "And it really was a resource, you couldn't have done something like that alone" (2017S, pre-service teacher).

> However, the participants also noted some of the pitfalls of working with many teachers. Particularly the in-service teachers noted how the temporary nature of the professional learning project underlined the lack of multiple teachers in everyday teaching: "On the other hand, I found it a challenge when we adjusted to the normal timetable and we had no pre-service teacher in the classroom anymore" (2015A, in-service teacher).

Having multiple teachers with different statuses could also cause situations in which the formal responsibilities of the students were unclear, as shown in the following excerpt.

> The teachers were somewhere far away, so if something happened, it's like—it's not my responsibility. Well, it kind of is my responsibility because the [in-service] teachers don't see a thing that happens. But that was kind of a wake-up call at that point (2017S, pre-service teacher).

Lack of time

One requirement that was perceived as hampering the collaboration was the lack of time for co-planning. Despite some time being allocated for planning at the beginning of the project, both the pre- and in-service teachers considered finding enough time challenging and that it hampered the effort to share responsibilities, as exemplified in the following quote.

> You need that planning time. We had so little time together. [...] That one planning meeting was a bit difficult to schedule and we divided into two. So, it would have been nice to still have one more to check things once more (2017S, pre-service teacher).

In the worst cases, the lack of time on the in-service teachers' part impeded the collaboration in the planning phase, demotivating the pre-service teachers: "The co-teaching went wrong because, due to the schedules, one teacher kind of couldn't attend at all" (2017S, pre-service teacher).

The in-service teachers also noted that more time for co-planning and co-reflection would have been beneficial for them all. However, some underlined the fact that in everyday work, time for planning is also scarce and any former experience of co-teaching can facilitate the process.

> In the end, the daily reality is that there's not enough time for planning. If you do things together, that's how it usually goes. [...] We also thought it would have been nice to meet and share thoughts after each day and discuss how to continue (2017S, in-service teacher).

Regarding the success of the co-teaching process, the in-service teachers raised the importance of school culture. In the following excerpt, an in-service teacher reflects on the importance of both the school management and the participating teachers acknowledging the value of the co-teaching project for professional learning. This made the participants put effort into the collaboration and provided them with the required resources, such as time for planning.

> Our principal was not flexible at all about these absences an letting us make it to the first meeting on time. [...] In general, it should be really emphasized to everyone that this is what teaching in teams [co-teaching] is all about and that it will benefit the teachers. And an example of how it should be done should be given (2016S, in-service teacher).

As shown in the above quotation, the prior experience of co-teaching practices became apparent in the teachers' reflection on their ability to contextualize the participation in the larger context of co-teaching in schools. However, one pre-service teacher also brought up how both the opportunity to learn from the co-teaching experience and the collaborative practices in schools contributed to their future careers as potential co-teachers, as exemplified in the following excerpt.

> I felt much more confident when we were together from the beginning to the end. [...] And I hope this kind of model will change the practices of solitary teachers who think I'll do this and that and won't tell anyone what I 've planned. And that we pre-service teachers also learn to plan together and share ideas and develop this approach (2017S, pre-service teacher).

Curricular demands

Another requirement that affected the course of the collaboration was related to curricular demands and opportunities. Before the co-planning began, the in-service teachers might have had preferences concerning the contents and themes that would match their current curriculum. Moreover, the pre-service teachers had material from their university courses and from the previous cycles of the project that could be applied when planning the STEM-related teaching modules. The result of this was that the pre-service teachers sometimes felt that the content of the teaching was pre-given. However, this was not considered problematic. The in-service teachers greatly appreciated the match between their curricula

and the teaching modules to be planned in the project, as exemplified in the following quotation: "It was nice that we took the things that suited our next period and which we had not yet done" (2015S, in-service teacher).

The current Finnish curriculum has requirements for multidisciplinary learning modules, which in many cases also require collaboration between several teachers. Particularly, the in-service teachers noted the curricular requirements in this regard and considered participation in the project practice for future skills and an important incentive for putting more effort into co-teaching. They also noted that the pre-service teachers would benefit from participating in terms of their futures: "Indeed, not everyone needs to reinvent the wheel behind closed doors in the classroom. And guess what, you too are tied to the new [national] curriculum, you'll be forced to do this 1 day" (2017S, in-service teacher).

Discussion

This study was designed to investigate how pre-service teachers and in-service teachers perceive and reflect on a co-teaching process that aims for equal collaboration and sharing responsibilities despite the different backgrounds of the participants. Whereas, shared responsibility and parity between the teachers is considered a key element of successful co-teaching practices (Strong and Baron, 2004; Pratt, 2014), understanding of how teachers can cope with the asymmetric backgrounds and inequal power relations during professional learning activities is lacking. The present study examined the challenges faced by pre-service and in-service teachers and how they might be overcome when—-instead of being mentor teachers and pre-service teachers—-they collaborate as equal participants in a team with a teacher educator.

The findings show how different roles and responsibilities negotiated during a co-teaching process both had benefits and created challenges for achieving parity within the team. In general, collaboration between teachers with different backgrounds and strengths is considered an advantage in co-teaching teams (Rytivaara et al., 2021). Yet, different collaboration needs or aims also tend to maintain and reproduce the asymmetric relationship through differential power dynamics and unequal partnership (Bacharach et al., 2010; Baeten and Simons, 2014; Rabin, 2020). The findings of this study demonstrate that different backgrounds in co-teaching teams may result in having and taking different roles. However, aiming to obscure roles for the sake of parity does not seem to be desirable. On the contrary, both the pre- and in-service teachers acknowledged that taking on different roles in the team was an important prerequisite for the goal of equal partnership.

To be beneficial, the difference between the roles should stem from different expertise, different perspectives on teaching,

and clearly identified and shared organizational responsibilities. This is in line with previous studies of successful co-teaching practices that have emphasized the importance of participants learning from each other (Bacharach et al., 2010; Faraclas, 2018) and the equal distribution of responsibilities (King-Sears and Strogilos, 2019). The findings of this study suggest that even for teams of such diverse collaborators as pre- and in-service teachers, similar attributes appear as the most important and rewarding aspects of co-teaching. In line with Pratt (2014) suggestion that the compatibility of the teacher team can derive from complementarity as well as similarity, our findings suggest that in heterogeneous teams with potential power asymmetries, emphasizing the complementary roles of the teachers is all the more important.

At the same time, negotiating desirable roles and sharing responsibilities appeared challenging for the pre- and in-service teachers. The findings showed how the problems stemmed from the unbalanced expectations of the participants. Some in-service teachers expected mainly new ideas and inputs from the pre-service teachers. Some tended to evaluate them and consequently did not adequately commit to the co-planning and co-teaching. These findings show that aiming for parity in the collaboration was not always easy for the in-service teachers despite it being explicitly stated as the goal of this project. Thus, we conclude, in line with Rabin (2020), that acknowledging and negotiating through the potential power imbalances is an essential but challenging requirement for parity. The essential relationships between the collaborating teachers usually require time to evolve (Rytivaara et al., 2019). The present findings highlight that in short-term collaboration, it appears to be even more important from the very beginning to agree on the roles and, for example, whether someone is being evaluated. One important perquisite for better parity appears to be that co-planning begins simultaneously or synchronously for all. If this fails, the expectations, curricular requirements, time allocation, and sharing responsibilities might turn out to be more difficult to negotiate in later phases. When teachers have different backgrounds and premises regarding the collaboration, the initial phases of co-teaching require extra attention, the responsibilities require clarification, and goals and resources require synchronization.

The findings further suggest that the institutional framework of co-teaching is important, particularly in cases of relatively short-term projects. Too scarce time resources or lack of support and flexibility from school management seems to greatly hamper collaboration and result in unequally shared responsibilities. The challenges of the institutional factors perceived by the teachers in this study, such as time management and school culture, are similar to those presented in previous studies (e.g., Faraclas, 2018). According to the present study, factors that can mitigate these challenges are previous co-teaching experience, a supportive school culture, and curricular incentives for co-teaching. These factors also

work as important motivators for both pre- and in-service teachers to commit to practicing co-teaching, by presenting it as valued and useful in the institutional sense. Although the participants noted that some of the benefits and opportunities provided by the co-teaching in this project were only temporary, they appreciated the co-teaching experiences for other reasons related to their professional learning. In this respect, this study suggests that the co-teaching process in teams containing both pre- and in-service teachers contributes to the professional learning of both, and when the collaboration was successful, the participants appreciated the model.

In this study, we investigated co-teaching in a context in which pre- teachers and in-service teachers voluntarily participated in a professional learning project, instead of it being a compulsory part of their studies or jobs. As co-teaching often takes place in mentor teacher–pre-service teacher relationships during the teaching practice period of teacher education, or as collegial collaboration in schools, one might ask whether the findings of the present study are also applicable to these settings. However, the findings also concern co-teaching in a broader sense. The complex dynamics of different teachers and the process-oriented nature of collaboration are typical of any co-teaching setting (Rytivaara et al., 2019; Strogilos and King-Sears, 2019). It has been suggested that overcoming challenges in the collaboration between in-service teachers is easier when teachers acknowledge and learn to make use of their individual expertise (Pratt, 2014). At the same time, the negative effects of the imbalanced power dynamics between pre-service teachers and their mentor teachers may be mitigated by, for example, increasing dialogic interaction, although the imbalance itself is often accepted as inevitable (Rabin, 2020). The present study suggests that similar challenges that characterize in-service teachers' co-teaching also arise between pre- and in-service teachers when the mentor teacher–pre-service teacher aspect reduced. However, more importantly, similar strategies that facilitate collaboration between teachers in schools also seem to work for asymmetric teams.

Limitations

The qualitative analysis focused on understanding the experiences and perceptions of planning and implementing co-teaching processes. The extent to which co-teaching and its different aspects were discussed during different cycles varied. Thus, based on this study, it is not possible to draw conclusions regarding the prevalence of these phenomena among teachers. However, the findings are not limited to the participating pre- and in-service teachers, and they also enable understanding co-teaching opportunities on a general level. This is because the teachers' discourse on co-teaching is typical of the culture—-the culture and characteristics of schools, and co-teaching in particular (c.f. Hsu and Roth, 2009).

Due to time constraints, not all the in-service teachers could attend the reflection session each year. This sometimes led to the situations in which the pre-service teacher of a certain team had to reflect on the process of their co-teaching without one or more (or once any) of their in-service team members being present. Although this can be considered a limitation for studying the whole team's reflection process, we do not regard it as a problem for studying the individual perceptions. On the contrary, this might sometimes have enabled the pre-service teachers to more freely raise their negative experiences of collaboration in the collective discussion, which could then lead to fruitful reflection with other teams.

Finally, it is worth noting that typically, financial reasons limited the number of teachers per classroom. We acknowledge that similar co-teaching practices with an increased teacher/student ratio in the classroom would be rare in schools, and we do not consider our model as such to be applicable in every teacher education system on a large scale. However, by focusing on the designing and planning of a successful co-teaching process, the present findings also inform the development of co-teaching processes in which less teaching resources are available for classroom activities. Whereas, learning co-teaching process and overcoming the potential challenges might be easier with extra resources, after the teachers have gained more co-teaching experience, financial constraints may not be so critical.

Implications

Co-teaching is an important part of current teacher education as a professional learning opportunity for both pre- and in-service teachers. This is due to pre-service teachers can learn from the experience and classroom-related knowledge of in-service teachers who, in turn, can learn from current educational research and innovations (Scantlebury et al., 2008; Faraclas, 2018; Rabin, 2020). Moreover, teachers need opportunities to practice co-teaching, which often takes a great deal of time and effort to adopt in schools (Bacharach et al., 2010; Rytivaara et al., 2019). Although the unequal power dynamics of the collaboration presented challenges to effective co-teaching practices, this study provides suggestions for developing various professional learning activities for co-teaching in mixed teams. Specifically, the findings inform the development of activities in which collaboration between pre- and in-service teachers is approached with the goal of parity, equal participation, and distribution of responsibilities. As pre-service teachers lack opportunities to participate in everyday school activities even during teaching practice periods (Fuentes-Abeledo et al., 2020), supporting authentic, equal collaboration with in-service teachers could be an important approach to improving teacher education.

First, it appears that the participants in co-teaching teams need not avoid taking different roles, as long as the roles stem from the different strengths and acquirements of the participants, the distribution of responsibilities is clearly negotiated everyone commits to it, and the institutional framework provides the time resources and support required for the process. Even if the roles of collaborating in-service and pre-service teachers are naturally different, approaches that play down the mentoring aspect of the relationship and aim for equality between the two are conceivable and appreciated by teachers.

Second, when developing teacher education and professional learning programs in which in-service teachers and pre-service teachers collaborate, the effort at the beginning of the co-teaching seems to be pivotal. Not only must all participants acknowledge and accept the goals, but the co-planning should preferably begin for everyone at the same time, as soon as possible, rather than orienting separately. Teachers appreciate building up trusting and encouraging relationships, reflecting on responsibilities and the co-teaching process, and so these should also be emphasized in the educational programs. Sufficient time for both the co-planning of and co-reflection on the actual teaching must be allocated, particularly in teams in which the members need to become acquainted with each other and at least some members have no previous experience in co-teaching or even teaching in general.

In conclusion, the findings of this study encourage teacher education and professional learning programs to adopt co-teaching practices in mixed teams and between pre- and in-service teachers, in formats in which the asymmetric power dynamics are actively moderated and the goal is to equally make use of everyone's efforts and expertise. Working in such teams might prove to be an effective way to implement and promote new teaching innovations for in-service teachers and pre-service teachers at the same time. Future studies are needed to investigate the actual processes of negotiating the roles during the different phases of co-teaching.

Data availability statement

The datasets presented in this article are not readily available because the participants and their schools may be identified from the data. Requests to access the datasets should be directed to AKe, anttoni.kervinen@helsinki.fi.

Ethics statement

Ethical review and approval was not required for the study on human participants in accordance with the local legislation and institutional requirements. Written informed consent for

participation was not required for this study in accordance with the national legislation and the institutional requirements.

Author contributions

AKe, PP-K, MK, and AKa: original idea and design, data analysis, drafting, and revision of the article. KJ and AU: original idea and design and revision of the article. All authors contributed to the article and approved the submitted version.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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