

This is a self-archived version of an original article. This version may differ from the original in pagination and typographic details.

Author(s): Vesisenaho, Mikko; Lakkala, Minna; Manu, Mari; Pöysä-Tarhonen, Johanna; Kallunki, Veera; Kyllönen, Mari; Toom, Auli; Peltonen, Marika; Häkkinen, Päivi

Title: Pre- and In-Service Teachers' Teamwork Behaviour in Integrated Teacher Training

Year: 2023

Version: Published version

Copyright: © İlknur Gökçe 2023

Rights: In Copyright

Rights url: <http://rightsstatements.org/page/InC/1.0/?language=en>

Please cite the original version:

Vesisenaho, M., Lakkala, M., Manu, M., Pöysä-Tarhonen, J., Kallunki, V., Kyllönen, M., Toom, A., Peltonen, M., & Häkkinen, P. (2023). Pre- and In-Service Teachers' Teamwork Behaviour in Integrated Teacher Training. *Journal of Teacher Education and Educators*, 12(1), 95-121.
<https://dergipark.org.tr/en/pub/jtee/issue/77184/1208171>

Pre-and In-Service Teachers' Teamwork Behaviour in Integrated Teacher Training

(Received on June 27, 2022 – Accepted on January 30, 2023)

Mikko Vesisenaho¹, Minna Lakkala, Mari Manu, Johanna Pöysä-Tarhonen, Veera Kallunki, Mari Kyllönen, Auli Toom, Marika Peltonen and Päivi Häkkinen

Abstract

Teamwork and collaboration skills are regarded as essential proficiencies in the current worlds of work, study and everyday life. A relevant question is whether and how pre-service teachers have opportunities to begin acquiring professional collaboration skills during their studies. In the current study, Finnish pre- and in-service teachers participating in a joint training programme were engaged in reflection tasks to evaluate their teamwork behaviour during a challenging pedagogical design task in mixed teams. The aim of this study was to examine how pre- and in-service teachers perceived their teamwork practices while performing authentic training activities together. The participants reflected on their own and their teams' behaviour in two ways: using a digital reflection survey tool repeatedly during the process and writing a reflection text. In the surveys, the participants scored both team behaviour and their own behaviour in the team relatively highly, but their own behaviour was evaluated as somewhat better than the overall team behaviour. In the reflective writing assignments, team behaviour was addressed more often than one's own behaviour. Experiences were mostly positive, but the participants also reported varying challenges. Based on the results, it can be suggested that to better guarantee the development of pre- and in-service teachers' collaboration skills, systematic guidance with adequate tools, is the requisite.

Key Words: Teamwork, reflection, teacher education, technology enhanced learning

Introduction

Nowadays, a need for teamwork exists in teachers' everyday schoolwork, and the requirements regarding teacher collaboration in schools are increasing (Jao & McDouglas, 2016; Pareja Roblin & Margalef, 2012). These vary from surface-level collaboration, such as exchanging teaching materials, to deep-level collaboration, where teachers jointly plan and teach in teams (co-teaching) or participate together in development actions (e.g., Saariaho, Toom, Soini, Pietarinen, & Pyhältö, 2019; Toom, Pietarinen, Soini, & Pyhältö, 2017).

Against their current needs, a relevant question is whether and how pre-service teachers have opportunities to learn professional collaboration skills during their studies. These can be partly acquired when studying in interdisciplinary settings where, for example, pre-service subject teachers, special education teachers and class teachers all participate in the same courses, or on courses where there are activities that provide

¹ Corresponding author, University of Jyväskylä, FINLAND, mikko.vesisenaho@jyu.fi, ORCID: 0000-0003-1160-139X

opportunities to learn to work together as a team (Kallunki, Karppinen, & Komulainen, 2017; Toom et al., 2017). At the same time, teacher educators can collaborate more closely with schools and familiarise pre-service teachers with professional practices and collaboration activities used in everyday schoolwork (Dobber, 2011; Tarnanen, Kostiainen, Kaukonen, Martin, & Toikka, 2021). For example, Cremers, Wals, Wesselink and Mulder (2016) introduced the concept of “hybrid learning configurations” to refer to pedagogical designs that connect institution-based learning with work experience by integrating studying and working (see also Tynjälä, Beusaert, Zitter, & Kyndt, 2022). Teaching internship periods that offer opportunities to obtain practical classroom experience often focus on primary instructional activities in the classroom (Soini, Pietarinen, Toom, & Pyhältö, 2015) and do not extend to multidimensional work in a professional community, for example. Connections between schools and teacher education institutions are also important for in-service teachers’ professional development because teachers benefit from updating and reflecting on their professional competencies related to teamwork skills, pedagogical methods, or technology-enhanced teaching (Avalos, 2011; Kostiainen et al., 2018).

The learning of collaboration skills is considered necessary but challenging because these need to be consciously practised together with others through authentic activities and collaboration situations (Strijbos, Engels, & Struyven, 2015). Skills related to interaction and collaboration are emphasised in curricula worldwide (Voogt, & Roblin, 2012), but educators lack pedagogical methods to support them in educational settings (Lakkala, Toom, Ilomäki & Muukkonen, 2015; Toom, 2017). Similarly, in workplace contexts, there is a need to seamlessly integrate methods and instruments that enable the evaluation and improvement of team performance into existing teamwork practices.

Which features, then, characterise a successful team? Based on a wealth of research-based knowledge, successful teams have a safe, encouraging and curious atmosphere, where participation is equal, communication is active, interaction is constructive and respectful, criticism and reflection are accepted and team members share information and listen to others, have shared visions and goals and help each other (Broussard, La Lopa & Ross-Davis, 2007; Decuyper, Dochy, & Van den Bossche, 2010; Fransen, Weinberger, & Kirschner, 2013). Individual members have a vital influence on how their team’s work; therefore, everyone should master the key skills that promote successful teamwork practices. To achieve this, in the current study, we implemented joint training for pre- and in-service teachers, including the practising of teamwork and collaboration skills. The training relied on pedagogical principles, including authentic practices and support for learning through active, reflective and collaborative assignments as well as on collaboration between in- and pre-service teachers and between higher education institutions and schools.

To sum up, this article aims to examine how pre- and in-service teachers perceived

the dynamics of teamwork practices during integrated training utilising a reflective writing task and a team reflection survey tool.

Theoretical framework

Collaboration and teamwork in teachers' work

Due to the increasingly complex and constantly changing world of work, working in teams is essential, and collaboration is considered as a necessary generic skill to be mastered. It has also long received substantial attention in research literature (Earnest, Williams, & Aagaard, 2017; Loughry Ohland, & Woehr, 2014; Planas-Lladó et al., 2021; Riebe, Girardi, & Whitsed, 2016). Regarding the significance of collaboration and teamwork, Riebe et al. (2016) pointed out in their review study that employers can place the same or more value on teamwork skills and related interpersonal skills than on graduates' technical skills (see also Britton, Simper, Leger, & Stephenson, 2017). Consequently, many higher education and teacher education institutions utilise pedagogies that are based on collaboration and working in teams (Britton et al., 2017; Loughry et al., 2014; Planas-Lladó et al., 2021; Riebe et al., 2016).

In this study, a "team" refers to two or more individuals working interdependently towards a common goal, which requires coordinating their efforts and pooling their knowledge, skills and resources (Salas, Cooke, & Rosen, 2008). Through teamwork pedagogy (Earnest et al., 2017; Riebe et al., 2016), skills that are generalisable across multiple settings can be systematically developed, supported and improved via teaching approaches that prioritise improving students' teamwork skills over task-related skills. To do so, according to Earnest et al. (2017), pedagogies need to be grounded on interdependent tasks, including students' explicit training in teamwork throughout their studies. In higher education, teamwork pedagogies may focus on developing students' communication and interpersonal skills, such as responsibility, open discourse, conflict management and collaborative problem solving (Kotlyar, Krasman, & Fiksenbaum, 2020; Riebe et al., 2016).

In the context of teacher education, it is expected that through participation in learning activities that require collaboration, individuals can observe the mechanisms that underlie social processes and, thereby, recognise the consequences of joint efforts on shared tasks (Häkkinen et al., 2017, 2020). The aim is to provide fertile ground for future teachers to become competent in participating more comfortably in collaborative work formations as teacher graduates. In addition to learning mechanisms that collaboration can trigger ("collaborating to learn") among students, it is also important to consciously train collaboration skills ("learning to collaborate") in pre-service teacher training (Häkkinen et al., 2017). In Finland, teachers' work is traditionally considered as relatively individual and autonomous work, but the collaboration capacity of future teachers should involve learning to teach based on applying collaborative

learning approaches with their students as well as collaborating with colleagues in the form of co-teaching (Saariaho et al., 2019; Soini et al., 2015; Toom, 2017; Virtanen, Niilo-Rämä, Pöysä-Tarhonen, & Häkkinen, 2019). In addition, collaboration is a vital element for teacher learning and development in the profession.

Yet, across higher education and teacher education institutes, the way in which educators implement learning practices that aim to enhance students' teamwork skills and how students interpret these practices may vary. Often, during the implementation of teamwork pedagogies, emphasis is placed on outcomes (Riebe et al., 2016); this is also true for the assessment of teamwork practices (Britton et al., 2017; Loughry et al., 2014; Planas-Lladó et al., 2021; Wilson, Ho, & Brookes, 2018). Yet, as Riebe et al. (2016) point out, when implementing teamwork pedagogies, the skills, processes and dispositional attributes are often less in focus. In this study, teamwork processes and, particularly, the participants' reflections on these processes, are in the limelight.

The role of reflective practice in learning

The central role of self-reflection in improving learning and expertise has long been investigated and emphasised in different domains and contexts. The popular reflective practitioner theory by Schön (1987) explicates the importance of deliberate reflection on experience to learn from it, for example, related to everyday work situations. Schön made a distinction between reflection-in-action (reflecting on your actions during an event or activity) and reflection-on-action (reflecting on actions and experiences that are already over). Bengtsson (1995) extended Schön's theorisation with reflection-for-action (reflecting on forthcoming actions in the classroom and anticipating them), thus making it even more relevant to reflection in the teacher profession. For pre- and in-service teachers, reflecting on practical actions, as well as conceptualising and learning from them, is essential for their professional learning and development (Toom et al., 2019). Moreover, for teams looking to learn and improve, the joint reflection of achievements and goals is relevant. Decuyper et al. (2010) considered team reflexivity to be a central facilitating process variable directing team development, and Lacerenza, Marlow, Tannenbaum and Salas (2018) mentioned team debriefing as an effective method for improving the team processes of many types of teams.

In work contexts, the potential for improved performance based on reflection has been investigated, for example, related to benefitting from feedback received by employees to complete tasks (Anseel, Lievens, & Schollaert, 2009), or building reflective structures, like systematic reflection methods, to enhance well-being and productivity at work (Yliruka & Karvinen-Niinikoski, 2013). In educational settings, self-reflection on performance and achievements is a widely applied approach to promote content and skill learning. For example, in teacher training, reflection on one's own teaching practices and conceptions of learning has been considered relevant to improving pedagogical expertise (Kostiainen & Pöysä-Tarhonen, 2019; Loughran, 2002). Pedagogi-

cal methods for self-reflection may include, among others, the use of self-assessment survey instruments (Belski & Belski, 2014), reflective writing assignments (McGuire, Lay, & Peters, 2009; Ortoleva, Betrancourt, & Billett, 2015) or self-monitoring devices (Durall, Leinonen, Gros, & Rodriguez-Kaarto, 2017).

Reflection efforts may focus on a variety of aspects of the working or learning activity. In our study, the object of reflection was working in teams and collaborative team practices. In previous studies, collaborative learning skills and group awareness have been considered relevant and studied, especially in the field of computer-supported collaborative learning (Buder, 2011). For example, Phielix, Prins, Kirschner, Erkens and Jaspers (2011) obtained results that revealed that a better awareness of group processes through peer feedback and self-reflection enhanced group-process satisfaction and the social performance of computer-supported collaborative learning groups. The acquisition of teamwork skills may also be a learning object in itself, like in the higher education case studied by Britton et al. (2017). They developed a survey instrument for the self- and peer-reflection of teamwork skills and concluded that teamwork skills improved over time when they were taught systematically and assessed repeatedly using a questionnaire.

In the current study, the participants and teams were engaged in reflecting on team behaviour to promote both their collaborative learning skills and understanding of teamwork dynamics and teamwork skills in general. The reflection was conducted both in the middle of and after the working process using a digital survey tool and a writing assignment as the reflection methods.

Research question

The aim of this paper is to examine how pre- and in-service teachers perceived and reflected on their teamwork in mixed teams when they performed a challenging pedagogical design task regarding implementing technology-enhanced learning units in school classrooms. The main research question (RQ) is as follows:

How did the pre- and in-service teachers perceive the dynamics of teamwork practices through the reflection instruments?

As the participants reflected on their own and team behaviour in two ways, using a digital reflection survey tool repeatedly during the process and writing a reflection text after the training, we also discuss how these reflection instruments served as a part of the pedagogical design aimed at improving the acquisition of teamwork skills and professional collaboration.

Methods

This study is a case study (Yin, 1993) applying a mixed-method approach (see Creswell, 2003; Johnson & Onwuegbuzie, 2004). The case consists of a teacher training implementation where the participants worked in seven teams, three of which were investigated as sub-cases to deepen the understanding of teamwork behaviour and experiences related to it.

Context, participants and setting

The study was conducted in a Finnish teacher education context in an integrated pre- and in-service teacher training setting. In Finland, pre-service teacher education is implemented at the university level, and a teacher needs either a master's degree in education or, alternatively, in a subject field, which includes teachers' pedagogical studies (60 ECTS) and the relevant amount of teaching practice (a minimum of 60 ECTS), to obtain the teaching qualification for comprehensive schools (Finnish National Agency for Education, 2021). In-service teachers' continuing education is the responsibility of each school or municipality, but there is no special structure in place for it.

The pre-service teachers participating in the training were fourth- and fifth-year students from the class teacher programme (N=15) and the information technology teacher education programme (N=9). The in-service teachers (N=7) were four class teachers of grades 3–6 and two subject teachers of languages and one of biology and geography from the same single structured comprehensive school. For the pre-service teachers, the training was part of their elective degree studies. The school was selected from among voluntary schools that offered single-structure basic education based on its own active interest in teacher education collaboration. For the in-service teachers, the training served as continuing education, and they registered voluntarily for it. Participation in the study was voluntary, and consent forms were collected from all the participants.

During the training, the participants were divided into seven mixed teams, with one in-service class teacher or subject teacher in each team. As described by (Kyllönen, Vesisenaho, Manu & Häkkinen, 2021), the teams' assignment was to design and implement a pedagogical meaningful technology-enhanced learning unit for the pupils of the participating in-service teachers. The starting point was to decide on a timely topic relevant to the goals of the curriculum. Another important aspect involved defining the joint team goals and the personal goals of each participant.

The whole training lasted for three months in total, including three joint workshop days for all the participants and one to two implementation days at the school with the pupils. Professional learning during the training was supported by teamwork activities, goal-oriented planning templates, supervision by teacher educators, school visits, authentic classroom experimentations and reflection tasks concerning personal and joint

learning experiences and teamwork behaviour (Figure 1).

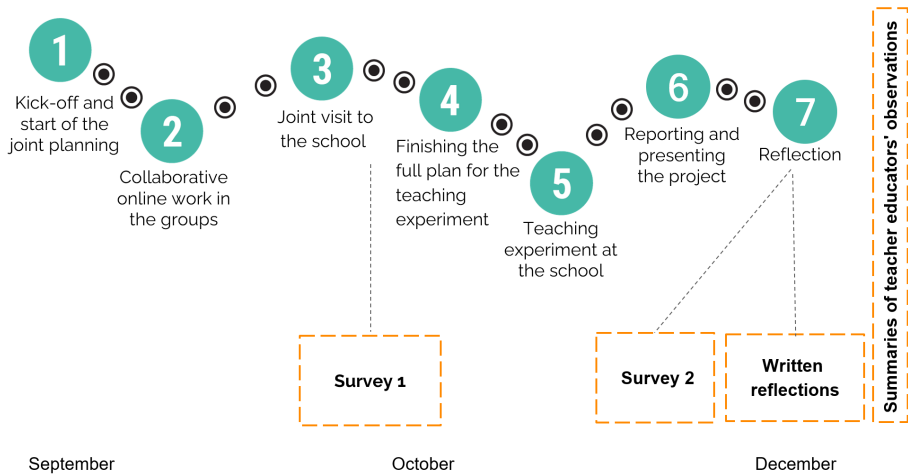


Figure 1: Elements of the collaborative design process and data collection

Data and instruments for data collection

The participants' self-reflection on their teams' behaviour based on the surveys and written reflection texts was used as research data in the study. The instruments and data collection are described below (see also Figure 1).

TeamFluent surveys

TeamFluent is a digital self-reflection tool (subsequently referred to as the survey tool) meant for educators and team facilitators and aimed at promoting the evaluation and improvement of collaboration practices in teams (Lakkala, Toom, Kallunki, Salmela-Aro & Männistö, 2019). The tool is a modular, web-based survey instrument that can be used for self- and co-reflection on one's own or a whole team's contextual behaviour in collaborative situations. The respondent sees the personal- and team-level results of the survey immediately after responding, which allows further reflection and discussion of team practices for improvement. The facilitator can flexibly tailor each survey to the context by choosing themes and perspectives according to a team's goals and needs. The survey items and themes were created through empirical research and piloting (Toom et al., 2020). The themes (e.g., helping others, sharing knowledge) represent behaviours that are known to be relevant to successful teamwork. Each theme includes three statements addressing a respondent's evaluations of their own or their overall team's behaviour regarding the evaluated collaboration situation (e.g., "I helped others with group work challenges", "Team members shared their ideas with each other"). The response scale is a Likert scale that ranges from 1 to 5.

In the study, seven themes were chosen for the surveys: *participating*

actively, helping others, working persistently, working in a goal-oriented way, taking into account others' opinions, brainstorming together and using digital technology in co-construction. The teacher educators and researchers considered these themes to be relevant to the type of teamwork. Each participant evaluated both their own behaviour and their whole team's behaviour based on the survey statements. The total number of statements was 42.

The participants completed two TeamFluent surveys (first: N=29, second: N=18). They became familiar with the tool in the kick-off meeting before starting the teamwork; these data were not included in the analysis. Three weeks after the start date, the teams filled the first TeamFluent survey after spending a day at the in-service teachers' school getting to know the pupils and observing the school setting. By then, the teams had started the planning process for their teaching experiments. The participants responded to the second TeamFluent survey and completed the reflective writing assignment (see Figure 1) at the end of the process. The teaching experiments had been conducted by then, and the teams had presented their posters.

Reflective writing assignment

The aim of the reflective writing assignment was to reflect on one's own experiences of the project and teamwork, as well as to learn reflection skills for future work (e.g., McGuire et al., 2009; Ortoleva et al., 2015). The participants completed their personal reflective writing assignments after completing the training. They were given the following question prompts to support their reflections: "What kinds of feelings did you experience during the training? Why? In which phases of the training? What kinds of learning experiences did you encounter? How well did you reach your personal learning goals? What do you think about your pedagogical digital skills/competence now? What expertise/knowhow/understanding do you want to deepen in the future? How well do you feel that the collaborative planning process took place in your team? What was your role during the teamwork?" Along with writing their reflection texts, the participants were asked to explore the results of the surveys. The length of their texts ranged from half a page to five pages (184–1097 words). The reflection texts were completed eight weeks after the kick-off date.

Teacher educators' observations of the teams' processes

In addition to the survey tool and reflection text data, the two teacher educators who supervised the teams' processes were asked to write a short description of their observations. These were used as complementary data to contextualise and interpret the results at the team level, but they were not analysed in detail.

Data analysis

Analysis of the survey tool data

The participants' responses to the TeamFluent self-reflection survey tool items were grouped according to the original themes, with each theme consisting of three items. Mean scores were calculated, and radar charts were created to visualise the results. The radar charts were similar to those automatically provided by the survey tool for the respondents to use for self- and co-reflection on team behaviour after finalising the surveys. The responses of participants who did not provide their consent to use their data for research purposes were deleted from the data.

The mean scores of both the participants' evaluations of their own behaviour and their teams' behaviour were calculated separately and compared. In addition, the results of the first and second surveys were calculated separately and examined. First, we calculated the means of the responses from all the training participants to get an overview of the trends and differences in the evaluations. Second, for the case descriptions of the teams that were examined in more detail, we addressed the results separately but in a similar way.

Analysis of the reflective writing assignments

The qualitative data analysis relied on abductive coding (Kennedy, 2018; Timmermans & Tavory, 2012), where some of the basic themes chosen for the survey were used as a starting point for selecting and categorising the reflection text content, but more categories were added during the analysis process in a data-driven manner. Inter-rater comparisons and joint coding made the coding process more open, reliable, explicit, and consistent (Joffe & Yardley, 2004).

First, the segments of the participants' reflection texts that addressed their own or their teams' behaviour were selected for analysis. The segments were coded first by one researcher (A), then by three dyads of researchers, utilising predefined categories based on four themes: active participation, working in a goal-oriented way, taking into account others' opinions and brainstorming together. Second, one additional independent researcher (B) extended the preliminary analysis by revising the segmentation if needed, adding other team behaviour themes (taking into account the data and other themes in the survey tool) and analysing the positive or negative focus of each quotation. Third, agreements and disagreements were discussed and negotiated between the coders (A & B), and the final categorization was established. Finally, the quotations were also categorised to illustrate either personal or team behaviour to examine the results separately from both perspectives in the same way as those from the survey tool. The final categorization was performed using the Atlas.ti version 8.4.20 application (Friese, 2014). Altogether, 290 text units were identified.

The categories addressing team behaviour are described in Table 1. We added

the collaborating category although it was not included in the surveys, because many segments of the reflection texts addressed teamwork success in general. The resolving conflicts category included in the surveys was left out due to the lack of mentions related to conflicts regarding teamwork in the reflective writing assignments. Examples of quotations from the assignments coded into each category are presented in Table 1 and in the Findings section.

Table 1.

Categories used in the analysis of teamwork behaviour descriptions in the reflective writings

Categories of teamwork behaviour	Examples from the data (additional categories in parentheses)
Collaborating	<i>I think that our team worked well; we were in touch with each other quite a lot. (Team, Positive (pos.))</i>
Participating actively	<i>But in remote working, at least in the final stage, the work remained my responsibility, which of course irritated me. (Team, Negative (neg.))</i>
Working persistently	<i>We were able to resolve the difficulties easily. It felt a little difficult at the beginning, but towards the end everything became clear and the implementation worked just fine. (Team, pos.)</i>
Working in a goal-oriented way	<i>I myself worked to achieve the goal of our team with the time and resources I had. However, I think I succeeded well and supported my team. (Personal, pos.)</i>
Taking into account others' opinions	<i>At times, it also felt that there was not total equality in the team between the class teacher students and IT students. At times, I even felt like we class students were not taken seriously and our ideas were ridden roughshod over. (Team, neg.)</i>
Brainstorming together	<i>Our design process as a team worked well, and everyone was able to present their ideas. (Team, pos.)</i>
Using digital technology in co-construction	<i>I was a bit confused about the pedagogical design task at the beginning, like the Skype calls. (Personal, neg.)</i>

Findings: How did the pre- and in-service teachers perceive the dynamics of teamwork practices through the reflection instruments?

The following subsections present the results of the participants' teamwork evaluations based on their reflections on their own and the overall team behaviour. The first two parts are based on the survey answers and reflective writing assignments of all the participants, and the third part examines the results of three teams, whose survey and reflection text results are complemented with the teacher educators' observations.

Reflection on teamwork behaviour with the survey tool

The survey tool portrays all the participants' reflections on their own and their teams' behaviour through radar charts, where the different behavioural themes assessed are presented on a scale of 1–5 (Figure 2). There were only minor differences between the average scores that participants gave to their own behaviour and their teams' behaviour in the first survey. The scores were quite high (4 or over), which indicates that the participants, in general, did not experience any major problems regarding their own or their team members' behaviour. At the time of the first survey, the teams had only worked remotely before the school visit but had advanced somewhat in their planning. The using technology in co-construction theme received the lowest scores in the first survey, which might relate to some challenges regarding working remotely using digital tools between the meetings.

In the second survey, the participants gave, on average, lower scores to their teams' behaviour than their own behaviour. At the time of the second survey, the teams had implemented their pedagogical designs, had learning sessions with pupils and gone through quite challenging phases in their teamwork, requiring everybody's contribution, which might have created a more critical attitude towards the team behaviour. The lower scores, especially regarding the participating actively theme, indicate that the participants felt that they had taken more responsibility for the teamwork. Similarly, the difference in the scores for working persistently implies that some members felt they had put more effort into completing the team task than others in their team. The scores for resolving conflicts decreased slightly. The average scores for all the behavioural themes were still quite high, meaning that the participants were, in general, quite satisfied with their teamwork experiences. However, using such averages does not allow careful the observation of differences between the teams, which is why we later explore the results of three of the teams in more detail.

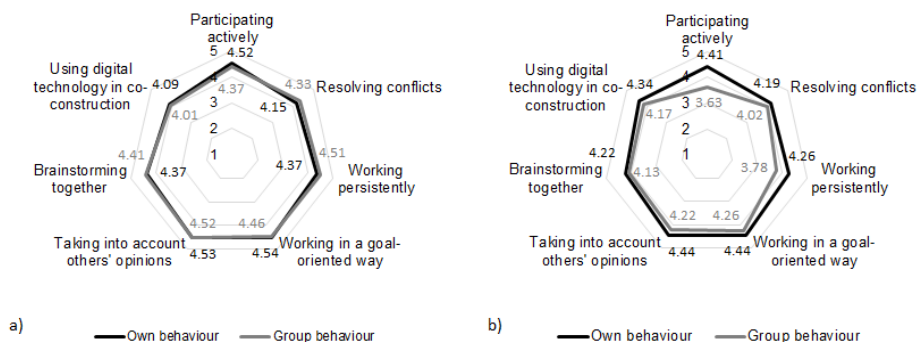


Figure 2: Participant responses to the survey tool: a) the first survey (N=29) and b) the second survey (N=18)

Reflection on teamwork-related experiences in the reflective writing assignment

The results on team experiences collected through the reflective writing assignments are displayed separately for text units that address team behaviour (Figure 3) and one's own behaviour within the team (Figure 4). In total, 225 (77.5%) focused on team behaviour and 65 (22.4%) on one's own behaviour.

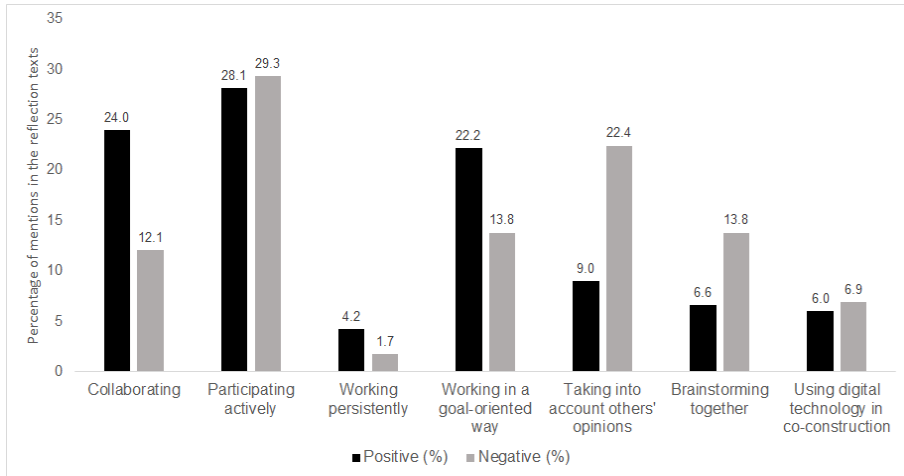


Figure 3: Positive and negative aspects of team behaviour mentioned in the participants' (N=27) reflective writings

Of the team behaviour references, 167 (74.2%) text units addressed the matter positively and 58 (25.8%) negatively (Figure 3). The most frequently mentioned aspects of team behaviour were collaboration in general, *active participation* and goal-oriented working, and they were mainly addressed in positive terms. For example, collaboration was described in the following way: “The planning and implementation of the project went really well for our team. It was nice to work with everyone.” *Goal-oriented working* was mainly evaluated through the quality of the final outcomes, but, in addition, the participants referred to the ambiguity of the goal in their text units regarding this theme.

Of all the aspects, *active participation* at the team level was described most often, also in critical terms, as shown by the following example:

Too bad that one fourth of the team participated in the activities significantly less than the rest of us. This had an effect on the atmosphere when you knew that not everyone was doing the same amount of work, and some were ready to get off lightly.

The references associated with *taking into account others' opinions* and *brainstorming together* were mentioned more rarely, but almost equally positively and critically. Both the benefits and challenges of collaboration between in-service teachers and teacher students were the most explicit in these categories, which the following two quotations demonstrate:

Planning with the teachers did not entirely follow co-teaching, as the project boundaries were immediately set in terms of implementation, such as a workshop model and two hours per workshop. If implementation and dates had been jointly agreed, I guess there would not have been feelings of inequality in terms of implementation days. (Taking into account others' opinions, neg.)

Nice pupils also grabbed the old war horse with enthusiasm to design a teaching experiment. (Brainstorming together, pos.)

Using digital technology in co-construction text units included a few mentions related to the possibilities and challenges of online meetings as well as some references to applications used (WhatsApp, Skype), but the total number of these was small. Similarly, *working persistently* as a team received only a few references, which were mainly associated with attitudes towards overcoming challenges in the working process.

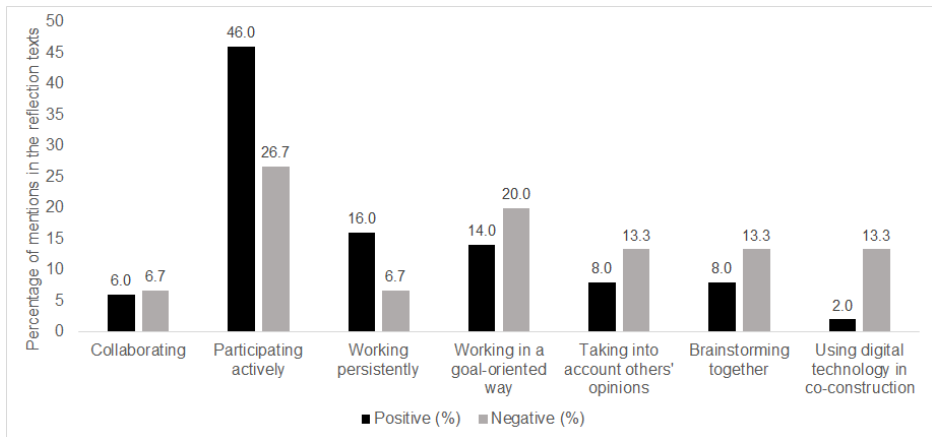


Figure 4: Aspects of the participants' (N=27) own behaviour within the teams mentioned in the reflective writing assignments

From the references associated with the participants' own behaviour in the teams, 50 (76.9%) addressed the matter positively and 15 (23.1%) negatively (Figure 4). *Participating actively* was emphasised. For example, one in-service teacher described her role positively in the following way:

My own role in the process was active, and I also wanted to share my experiences of practical teaching with [teacher] students who had only been studying for a short time.

Persistent working concerning the participants' own behaviour was associated with mentions of continuing the work despite the challenges experienced both during the task and the collaboration. *Working in a goal-oriented way* at the individual level related to crystallising the focus of the teaching experiment or praising its successful finalisation, as in the following quotation:

Making the teaching plan also forced me to think about the aims and methods of the experiment. In other words, after the first day in [the school], I started to feel like this was going to be something.

Other aspects of one's own behaviour in the team (collaborating, *taking into account others' opinions*, *brainstorming together* or *using digital technology in co-construction*) were rarely discussed in the reflective assignments.

Contextualised teamwork experiences from three selected teams

Team A: Persistent collaboration

Team A included three pre-service class teachers, one pre-service teacher of IT and one in-service class teacher. The object of their joint work was to design a collaborative teaching experiment for pupils from grades 3 and 6, where the students would produce and document a music video on sustainable development and practise, for example, song and manuscript writing as well as video recording and editing. The purpose was to inspire pupils to discuss the meaning of sustainable development in their everyday lives.

The members' evaluations of their own and the team's behaviour using the survey tool are shown in Figure 5. The members were more critical in the second survey, but they evaluated their own behaviour, on average, more highly than the overall team behaviour. *Participating actively* and *working persistently* received relatively low scores in the evaluations of team behaviour.

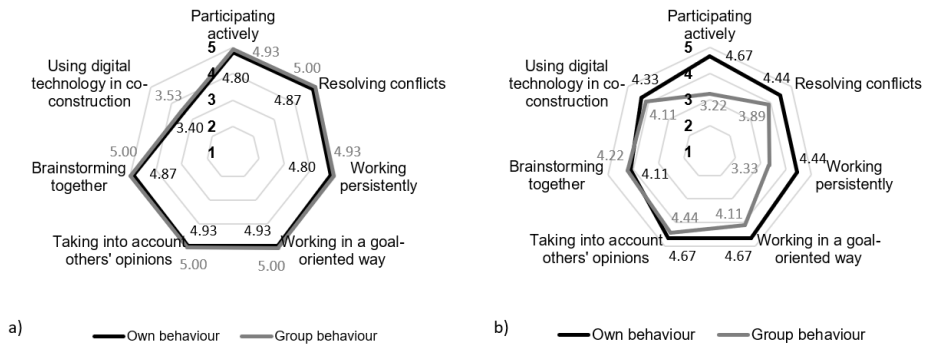


Figure 5: Team A members' evaluations of their own and the team's behaviour using the TeamFluent survey tool: a) first survey (N=5) and b) second survey (N=3)

In the reflective writing assignments, the members of Team A described the team's behaviour mainly in positive terms. The most often mentioned themes were *collaborating* (f=9), *participating actively* (f=7) and *brainstorming together* (f=4). Two critical references related to the uneven division of labour in teamwork. Others mentioned team-level behaviour related to *working persistently* (f=2 pos.), **working in a goal-oriented way** (f=2 pos.), *taking into account others' opinions* (f=2 pos., f=2 neg.), *collaborating* (f=1 neg.) and *brainstorming together* (f=1 neg.).

Almost all the references addressing the members' own behaviour within the team were positive, mostly related to working in a *goal-oriented way* (f=7) and *participating actively* (f=6). There were only four critical mentions of individual behaviour in the team, focusing on working in a *goal-oriented way* (f=2), *collaborating* (f=1) and *brainstorming together* (f=1).

According to the teacher educators' observations, most of the team members worked actively throughout the entire process. Their goal-oriented way of engaging was already visible in the first meeting as they started to plan and organise their teaching experiment using concrete steps aimed at a coherent whole. During the obligatory online meeting with the teacher educators, the team members described themselves as experiencing a flow of ideas without the need for extra support. When the learning experiment was conducted in the school, the team continued working in an organised and persistent way. Even though one member was not able to participate during the second day of the experiment, the other members covered the absence by cooperating even more closely with each other.

To conclude, in Team A, some team members felt that they had done more than others, which appeared in the second survey as a more critical evaluation of the team's behaviour than their own behaviour. Correspondingly, the written reflections highlighted the team members' positive evaluations of their own active participation and wor-

king in a goal-oriented way. The members who answered the second survey (three out of five) might have been the most active ones, who felt that the responsibilities were not divided evenly. It is possible that the absence of one team member on the second day of the learning experiment affected the evaluation of the team's active participation negatively.

Team B: Continuous collaboration

Team B consisted of two pre-service class teachers, one pre-service teacher of IT and one in-service class teacher. The teaching experiment of their choice was to organise a learning unit where small groups of pupils in grades 3 and 6 would plan and produce online word games on sustainable development as well as playing and recording theme songs for the games. In addition, the focus was on practising pupils' 21st-century skills and supporting their collaboration abilities.

Figure 6 presents the team members' evaluations of their own and the team's behaviour using the survey tool. The illustrations show that there was, in general, a slight decrease in the scores between the first and the second surveys, but no major differences between the surveys or between the scores for the different themes, except for the difference in the first survey between one's own and team behaviour scores in the themes Resolving conflicts and Working persistently.

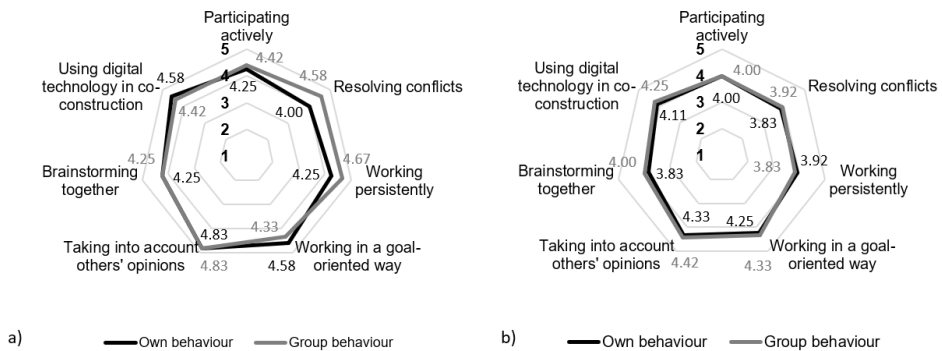


Figure 6: Team B members' evaluations of their own and the team's behaviour using the TeamFluent survey tool: a) first survey (N=4) and b) second survey (N=4)

The reflection texts described the team behaviour mainly in positive terms. Aspects related to *collaborating* (f=7 pos., f=2 neg.), *participating actively* (f=6 pos.) and working in a *goal-oriented way* (f=6 pos.) were mentioned most often. References to working in a goal-oriented way praised the high-quality final outcomes of the team and *working persistently* (f=2 pos.) reflections described how the team overcame challenges. Other team references related to *brainstorming together* (f=1 neg.) and *using*

digital technology in co-construction (f=1 pos.).

The reflective writing assignments included only nine remarks about the members' own behaviour within the team. Four positive comments related to participating actively, working in a goal-oriented way, taking into account others' opinions and using digital technology in co-construction. Five critical evaluations concerned *using digital technology in co-construction* (f=2), working persistently, taking into account others' opinions and brainstorming together.

According to the teacher educators' observations, Team B faced some challenges at the beginning of the process as the members found it slightly difficult to produce possible ideas for the learning experiment. After brainstorming together intensively, they managed to choose a topic. By the online meeting with the teacher educators, the team had created some preliminary guidelines for the experiment but was still struggling with how it would combine the Finnish language and music with its topic. The intensive brainstorming continued during the meeting but, in the end, the team decided to delay further planning until the school visit day. However, some active work had clearly taken place before the visit since, by then, the team had managed to build an initial plan and was ready to develop it.

As a summary, based on the survey answers, no specific challenges to the teamwork were identified, and the fact that all the team members answered both surveys indicated their responsible attitude towards the work. However, the average scores were not as high as they could have been, which revealed that the participants were not fully satisfied with the teamwork. The written reflections focused on describing the team behaviour, whereas evaluations of team members' own behaviour were scarce. Based on the results, it can be concluded that although the team faced some challenges at the beginning of the design process, the members managed to work well together, and they were content with the results in the end.

Team C: Challenging collaboration

Team C included two pre-service class teachers, two pre-service teachers of IT and one in-service subject teacher of geography and biology. The topic of their teaching experiment was to design a task for grade 8 pupils to produce animations and videos on environmental impact as a part of their geography course. Pupils worked in small groups and used iPad applications for the productions. The goal was related to the environment and practising skills in critical thinking, collaboration and creative problem solving.

The members' evaluations of their own and the team's behaviour using the survey tool are shown in Figure 7. The members gave higher scores in the second survey compared to the first survey concerning one's own behaviour within the team. In the evaluation of the overall team behaviour, active participation received a lower score in the second survey than in the first, and the lowest score when compared to the other

themes in the second survey. This indicated that each participant who answered the final survey (three out of four) felt that they had taken more responsibility for the work than the other team members.

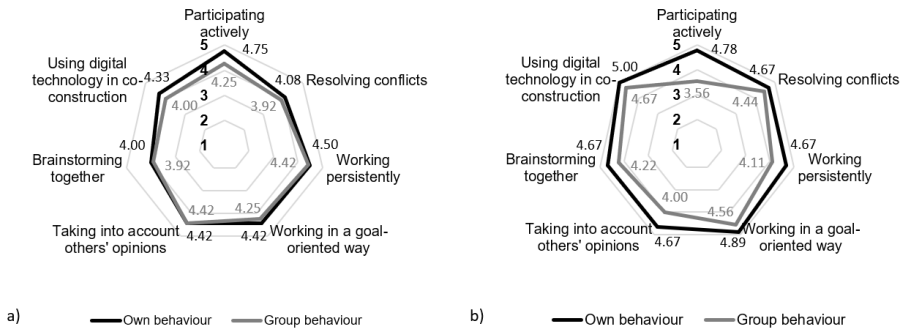


Figure 7: Team C members' evaluations of their own and the team's behaviour using the TeamFluent survey tool: a) first survey (N=4) and b) second survey (N=3)

In the reflective writing assignments, the members of Team C commented on the team behaviour in critical terms almost as frequently as in positive terms. *Participating actively* was frequently mentioned, both from positive (f=6) and negative (f=5) perspectives, and interestingly, sometimes in the same quotation:

While some in our team did a little more work on project planning than others, we each had our own motive and expectations for learning, each of which we took responsibility for ourselves. It was unrealistic to assume that there would be an even division of labour in the team, as each member of the team was involved in the project for different reasons.

Working in a goal-oriented way received both positive (f=6) and negative (f=3) remarks. Moreover, other aspects of team practices were evaluated by including both positive and negative features: *using digital technology in co-construction* (f=3 pos., f=3 neg.), *taking into account others' opinions* (f=3 pos., f=3 neg.), *collaborating* (f=3 pos., f=2 neg.) and *working persistently* (f=1 pos., f=1 neg.). *Brainstorming together* was only mentioned in one positive reference.

The members recognised their own contributions to the teamwork in mainly positive terms in the reflection texts: *participating actively* (f=5 pos., f=1 neg.), *working in a goal-oriented way* (f=3 pos.), *working persistently* (f=2 pos.) and *taking into account others' opinions* (f=1 pos., f=1 neg.).

According to the teacher educators' observations, Team C brainstormed together intensively in the first meeting and quickly set up a clear joint goal for the learning

experiment. Its working style was quite independent right from the beginning as it seemed that the pre-service teachers did not want support from the teacher educators. The pre-service teachers were slightly reluctant to participate in the online meeting with the teacher educators since they thought the meeting would be unnecessary as they had already made a good start with the planning process. Afterwards, however, they considered the meeting as having been useful because the teacher educators challenged them to argue in favour of their plan and decisions. They also negotiated regarding duties and shared responsibilities of the team members during the online meeting, which enhanced their working towards an even more goal-oriented outcome. After the learning experiment, it became clear that the pre-service class teachers and pre-service teachers of IT had experienced a conflict regarding their differing working styles during the planning process. Some felt that their thoughts and ideas were not always taken seriously enough, while others felt that they had to do too much work within the team. The in-service teacher was unaware of the conflict. In the end, they were all satisfied both with their plan and the learning experiment.

To conclude, Team C appeared to face some challenges in collaboration, especially when taking into account others' opinions and sharing responsibility evenly among the team members, which came up both in the survey answers and, especially, in the reflective writing assignments. Additionally, the teacher educators' observations supported this interpretation of the team's working process and problems regarding the division of work.

Discussion

The aim of this study was to examine how pre- and in-service teachers perceived their teamwork practices during authentic training activities performed together. Their perceptions of the teamwork practices were captured via self- and team-reflection survey tool as the primary source, combined with a reflective writing assignment. The findings based on the analysis of these perceptions are synthesized and discussed in this section.

First, the participants' observations of the dynamics of teamwork practices were studied. The results made visible the multidimensional learning processes in the teams' reflections, especially the awareness of their own and their teams' work. Based on the survey tool results, the participants perceived their teamwork behaviour as of a high quality, with all the survey themes receiving relatively high scores. In addition, in the reflective writings, the majority of the evaluations (75%) addressed team practices with positive terms. These findings are in line with earlier research indicating high ratings in Finnish pre-service teachers' perceptions of their dispositions regarding collaboration and teamwork (Häkkinen et al., 2020).

In the surveys, the participants scored their own behaviour, on average, somewhat higher compared with the overall team behaviour, especially at the end of the process

after completing the challenging teaching experiment together. The biggest differences between the evaluations of one's own and the teams' behaviour can be found in the survey themes of participating actively and working persistently, which indicate that the participants perceived they had taken more responsibility in finalising the teams' tasks than others in their teams. Experienced differences during participation in an activity are a typical problem in student teams (Allan, 2016).

In the reflective writing assignments, team behaviour was addressed more often than one's own behaviour. The evaluation profiles of the team and one's own behaviour were somewhat different, but active participation was highlighted in both. Accordingly, in the evaluations of one's own behaviour, participating actively was mentioned much more often than any other theme. This also indicates that taking responsibility for one's contribution was considered an important aspect of successful teamworking.

Working in a goal-oriented way was another theme that was frequently mentioned in the reflective writings when addressing overall team behaviour. This might relate to the nature of the team task, including the requirement to design and implement a teaching experiment in a real classroom setting – a challenging task that had to be completed properly and on time.

The reflective writing assignment revealed certain challenges in the teamwork, such as the in-service teachers' perceived dominance or occasional differences in the group members' completion of the task. Yet, despite being included in the surveys, the resolving conflicts category did not appear in this dataset. It might be that no severe discrepancies or disagreements arose within the teams and that minor challenges were resolved without being seen as conflicts. As a slight decrease was observed regarding this theme across the two surveys, this could indicate that any conflicts were somehow resolved during the process.

One focus of the training was to improve teacher education students' digital pedagogical skills. Therefore, the participants were requested to apply technologies when designing their learning units for the pupils. However, the discussion on using digital tools in the teams' own collaboration practices was scarce. The use of digital tools in the teams' co-construction activities in designing the learning units was not explicitly directed or required in the training, and each team made its own decisions about how to organise its collaboration during the remote phases. From the reflections, it was not possible to deduce whether digital tools were used.

The team-based results grounded in the qualitative data (reflection texts and teacher educators' observations) indicated that the working process in each group was diverse. Some of the groups faced more challenges, especially regarding goal setting, even participation, planning, and decision making. However, the members of all the teams were satisfied with the final outcomes regardless of the aforementioned challenges.

Furthermore, when considering how the reflection instruments served as a part

of the pedagogical design, the results from the survey tool and the reflective writing assignments showed that they complemented each other in the evaluation of the teams' behaviour. Well-functioning areas of teamwork received recognition from both instruments, whereas potential problems in team behaviour were seen as deviations between one's own and team behaviour in the visualised radar charts, as well as positive and negative comments in the reflective writing assignments. When the surveys and the reflective writing assignments were observed more carefully, in two of the three selected teams (A and C), active participation was found to be one problematic area of teamwork, in relation to highlighting one's own behaviour positively and regarding the variety of positive and negative aspects.

In addition, there were problems with taking into account the opinions of teammates in Team C, which, according to the written assignments, was caused by the lack of equality between the team members but was not recognisable in the survey results. In the case of Team B, the teamwork seemed to function relatively equitably based on the survey results and reflective writing assignments.

The results show the importance of the systematic guidance of pre- and in-service teachers' acquisition of collaboration skills and of supporting their development with a rigorous survey instrument and procedure, including written reflections. Both collaboration skills and reflections on the same are challenging to learn and require extensive focused support (cf. Husu, Toom, & Patrikainen, 2008; Toom et al., 2019). The question arises as to whether the TeamFluent survey tool could have been used in an even more effective way to monitor team practices throughout the process and implement corrective actions if needed. When the teams responded to the survey for the first time, the main urgent focus of the meeting was to design the technology-enhanced learning units for the pupils: not much time was used to reflect on the survey results, and the teams did not engage in this spontaneously. The reflective writings were written afterwards when the process was already over.

It was interesting that the same themes included in the surveys were also identified in the qualitative reflection texts based on data-driven analysis (except resolving conflicts). In sum, they represented generally known central aspects of team behaviour (e.g., Broussard et al., 2007; Decuyper et al., 2010; Fransen et al., 2013). By answering the survey, it is assumed that the participants adopt the concepts and learn to pay attention to these aspects related to team dynamics. Raising awareness is a central purpose of the TeamFluent tool, but more research with a larger population of students is needed to examine whether the use of the tool affected the participants' ability to perceive their teamwork behaviour more consciously.

In the future, for example, a quasi-experimental approach could be applied, as the current study was exploratory in nature. More detailed investigations could be beneficial to better understanding why some teams only perform mechanical teamwork, whereas others also evaluate and reflect on their shared activities. For these purposes,

observing and documenting team discussions could help to gain a deeper understanding of the results acquired via reflection tools.

Finally, the study has certain limitations. First, fewer responses were received to the second survey than expected, and the participants might have required more active prompting in this regard. Second, a more systematic approach and integration of the reflection tools could have been applied (e.g., by already utilising the outcomes of the survey tool more carefully during the working process). In addition, the use of the survey tool for team reflection could be investigated in team processes that are carried out over a longer period.

Conclusion

This study offers an interesting context and efforts towards integrating the deliberate practising of professional collaboration in multi-subject teaching experiments in teacher education. Our results highlight the importance of addressing and promoting collaboration skills in teacher training. Teachers are supposed to teach collaboration skills to their students, which requires that they be aware of and master good teamwork practices themselves. Our study demonstrates that teamwork might be challenging for pre- and in-service teachers. In the training investigated, teamwork awareness and collaboration skills were mainly promoted through self-reflection assignments. Including the explicit training of teamwork skills would have fulfilled the principles of teamwork pedagogy even better.

The practical implication of using the survey tool was that the themes raised by it were also relevant for the entire process through increasing the teams' awareness of and supporting them in focusing on certain teamwork elements. These versatile issues were addressed in the written reflections. One suggestion for the future is that the self-evaluation survey and reflection texts could be integrated into the same tool. Such a tool could offer relevant information for the learners themselves, but also for supervisors (e.g., for identifying critical challenges in teamwork and supporting teams to solve them during the process).

Acknowledgements

The research is linked to a broader teacher education development project, OpenDigi funded by the Ministry of Education and Culture in Finland and implemented by five Finnish universities. The development of TeamFluent survey tool has been supported by Business Finland's Research to Business Funding granted for Dlearn. Helsinki.

References

- Allan, E. G. (2016). "I hate group work!": Addressing students' concerns about small-group learning. *InSight: A Journal of Scholarly Teaching*, *11*, 81–89. Retrieved from <https://insightjournal.park.edu/wp-content/uploads/2020/01/8-Allan.pdf>
- Anseel, F., Lievens, F., & Schollaert, E. (2009). Reflection as a strategy to enhance task performance after feedback. *Organizational Behavior and Human Decision Processes*, *110*(1), 23–35. doi: 10.1016/j.obhdp.2009.05.003
- Avalos, B. (2011). Teacher professional development in teaching and teacher education over ten years. *Teaching and Teacher Education*, *27*(1), 10–20.
- Belski, R., & Belski, I. (2014). Cultivating student skills in self-regulated learning through evaluation of task complexity. *Teaching in Higher Education*, *19*(5), 459–469. doi: 10.1080/13562517.2014.880685
- Bengtsson, J. (1995). What is reflection? On reflection in the teaching profession and teacher education. *Teachers and Teaching: Theory and Practice*, *1*(1), 23–32.
- Britton, E., Simper, N., Leger, A., & Stephenson, J. (2017). Assessing teamwork in undergraduate education: A measurement tool to evaluate individual teamwork skills. *Null*, *42*(3), 378–397. doi: 10.1080/02602938.2015.1116497
- Broussard, S. R., La Lopa, J. M., & Ross-Davis, A. (2007). Synergistic knowledge development in interdisciplinary teams. *Journal of Natural Resources & Life Sciences Education*, *36*, 129–133.
- Buder, J. (2011). Group awareness tools for learning: Current and future directions. *Computers in Human Behavior*, *27*(3), 1114–1117. doi: 10.1016/j.chb.2010.07.012
- Cremers, P. H. M., Wals, A. E. J., Wesselink R., & Mulder, M. (2016). Design principles for hybrid learning configurations at the interface between school and workplace. *Learning Environments Research*, *19*(3), 309–334.
- Creswell, J. W. (2003). *Research design: Qualitative, quantitative, and mixed methods approaches* (2nd ed.). Thousand Oaks: Sage publications.
- Decuyper, S., Dochy, F., & Van den Bossche, P. (2010). Grasping the dynamic complexity of team learning: An integrative model for effective team learning in organisations. *Educational Research Review*, *5*(2), 111–133. doi: 10.1016/j.edurev.2010.02.002
- Dobber, M. (2011). *Collaboration in groups during teacher education* (Doctoral thesis, ICLON, Leiden University). Retrieved from <https://hdl.handle.net/1887/17720>
- Durall, E., Leinonen, T., Gros, B., & Rodriguez-Kaarto, T. (2017). Reflection in learning through a self-monitoring device: Design research on EEG self-monitoring during a study session. *Designs for Learning*, *9*(1), 10–20. Retrieved from <https://files.eric.ed.gov/fulltext/EJ1235592.pdf>
- Earnest, M., Williams, J., & Aagaard, E. (2017). Toward an optimal pedagogy for teamwork. *Academic Medicine*, *92*(10), 1378–1381. doi: 10.1097/ACM.0000000000001670

- Fransen, J., Weinberger, A., & Kirschner, P. A. (2013). Team effectiveness and team development in CSCL. *Educational Psychologist*, 48(1), 9–24.
- Friese, S. (2014). *Qualitative data analysis with ATLAS.ti*. London: SAGE.
- Husu, J., Toom, A., & Patrikainen, S. (2008). Guided reflection as a means to demonstrate and develop student teachers' reflective competencies. *Reflective Practice*, 9(1), 37–51.
- Häkkinen, P., Järvelä, S., Mäkitalo-Siegl, K., Ahonen, A., Näykki, P., & Valtonen, T. (2017). Preparing teacher-students for twenty-first-century learning practices (PREP 21): A framework for enhancing collaborative problem-solving and strategic learning skills. *Teachers and Teaching: Theory and Practice*, 23(1), 25–41.
- Häkkinen, P., Virtanen, T., Virtanen, A., Näykki, P., Pöysä-Tarhonen, J., Niilo-Rämä, M., & Järvelä, S. (2020). Finnish pre-service teachers' perceptions of their strategic learning skills and collaboration dispositions. *Journal of Education for Teaching*, 46(1), 71–86.
- Jao, L., & McDougall, D. (2016). Moving beyond the barriers: Supporting meaningful teacher collaboration to improve secondary school mathematics. *Teacher Development*, 20(4), 557–573.
- Joffe, H., & Yardley, L. (2004) Content and thematic analysis. In D. F. Marks & L. Yardley (Eds.), *Research methods for clinical and health psychology* (pp. 56–68). London: Sage.
- Kallunki, V., Karppinen, S., & Komulainen, K. (2017). Becoming animated when teaching physics, crafts and drama together – A multidisciplinary course for class teacher students. *Journal of Education for Teaching*, 43(1), 32–47. doi: 10.1080/02607476.2016.1182373
- Kennedy, B. (2018). Deduction, induction, and abduction. In U. Flick (Ed.), *The Sage handbook of qualitative data collection* (pp. 49–64). London: SAGE Publications Ltd. doi: 10.4135/9781526416070
- Kyllönen, M., Vesisenaho, M., Manu, M., & Häkkinen, P. (2021). The OpenDigi project harvest: Teachers, teacher educators and students developing their digi-pedagogical skills together. In A. Veijola, O. Salo, & S. Roos (Eds.), *Meaningful learning in diverse learning environments* (pp. 163–179). Jyväskylä: University of Jyväskylä Teacher Training School.
- Kostiainen, E., & Pöysä-Tarhonen, J. (2019). Meaningful learning in teacher education, characteristics of. In M. A. Peters (Ed.), *Encyclopedia of teacher education*. Springer. Retrieved from doi: 10.1007/978-981-13-1179-6_50-1
- Kostiainen, E., Ukskoski, T., Ruohotie-Lyhty, M., Kauppinen, M., Kainulainen, J., & Mäkinen, T. (2018). Meaningful learning in teacher education. *Teaching and Teacher Education*, 71, 66–77. doi: 10.1016/j.tate.2017.12.009.
- Kotlyar, I., Krasman, J., & Fiksenbaum, L. (2020). Virtual high-fidelity simulation assessment of teamwork skills: How do students react? *Null*, 53(3), 1–20. doi: 10.1080/15391523.2020.1783401

- Lacerenza, C. N., Marlow, S. L., Tannenbaum, S. I., & Salas, E. (2018). Team development interventions: Evidence-based approaches for improving teamwork. *American Psychologist, 73*(4), 517–531. doi: 10.1037/amp0000295
- Lakkala, M., Toom, A., Ilomäki, L., & Muukkonen, H. (2015). Re-designing university courses to support collaborative knowledge creation practices. *Australasian Journal of Educational Technology, 31*(5), 521–536. doi: 10.14742/ajet.2526 .
- Lakkala, M., Toom, A., Kallunki, V., Salmela-Aro, K., & Männistö, T. (2019, November). Developing a reflection tool for self- and co-evaluation of socio-epistemic practices in collaboration. Paper presented at the FERA Conference on Education, Joensuu, Finland.
- Loughran, J. J. (2002). Effective reflective practice. In search of meaning in learning about teaching. *Journal of Teacher Education, 53*(1), 33–43. doi: 10.1177/0022487102053001004
- Loughry, M. L., Ohland, M. W., & Woehr, D. J. (2014). Assessing teamwork skills for assurance of learning using CATME team tools. *Journal of Marketing Education, 36*(1), 5–19. doi: 10.1177/0273475313499023
- McGuire, L., Lay, K., & Peters, J. (2009). Pedagogy of reflective writing in professional education. *Journal of the Scholarship of Teaching and Learning, 9*(1), 93–107. Retrieved from <https://files.eric.ed.gov/fulltext/EJ854881.pdf>
- Ortoleva, G., Betrancourt, M., & Billett, S. (Eds.). (2015). *Writing for professional development*. Leiden/Boston: Brill. doi: 10.1163/9789004264830
- Pareja Roblin, N., & Margalef, L. (2012). Learning from dilemmas: Teacher professional development through collaborative action and reflection. *Teachers and Teaching: Theory and Practice, 19*(1), 18–32.
- Phielix, C., Prins, F. J., Kirschner, P. A., Erkens, G., & Jaspers, J. (2011). Group awareness of social and cognitive performance in a CSCL environment: Effects of a peer feedback and reflection tool. *Computers in Human Behavior, 27*(3), 1087–1102. doi: 10.1016/j.chb.2010.06.024
- Planas-Lladó, A., Feliu, L., Arbat, G., Pujol, J., Suñol, J. J., Castro, F., & Martí, C. (2021). An analysis of teamwork based on self and peer evaluation in higher education. *Null, 46*(2), 191–207. doi: 10.1080/02602938.2020.1763254
- Finnish National Agency for Education (2021). Recognition of teaching qualifications and teacher education studies. Retrieved from <https://www.oph.fi/en/services/recognition-teaching-qualifications-and-teacher-education-studies>
- Riebe, L., Girardi, A., & Whitsed, C. (2016). A systematic literature review of teamwork pedagogy in higher education. *Small Group Research, 47*(6), 619–664. doi: 10.1177/1046496416665221
- Saariaho, E., Toom, A., Soini, T., Pietarinen, J., & Pyhältö, K. (2019). Student-teachers' and pupils' co-regulated learning behaviours in authentic classroom situations in teaching practicums. *Teaching and Teacher Education, 85*, 92–104. doi: 10.1016/j.tate.2019.06.003

- Salas, E., Cooke, N. J., & Rosen, M. A. (2008). On teams, teamwork, and team performance: Discoveries and developments. *Human Factors*, 50(3), 540–547. doi: 10.1518/001872008X288457
- Schön, D. A. (1987). *Educating the reflective practitioner: Toward a new design for teaching and learning in the professions*. San Francisco: Jossey-Bass.
- Soini, T., Pietarinen, J., Toom, A., & Pyhältö, K. (2015). What contributes to first year student teachers' sense of professional agency in the classroom? *Teachers and Teaching: Theory and Practice*, 21(6), 641–659. doi: 10.1080/13540602.2015.1044326
- Strijbos, J., Engels, N., & Struyven, K. (2015). Criteria and standards of generic competences at bachelor degree level: A review study. *Educational Research Review*, 14, pp. 18-32. doi: 10.1016/j.edurev.2015.01.001
- Tarnanen, M., Kostianen, E., Kaukonen, V., Martin, A., & Toikka, T. (2021). Towards a learning community: Understanding teachers' mental models to support their professional development and learning. *Professional Development in Education*. doi: 10.1080/19415257.2021.1959383
- Timmermans, S., & Tavory, I. (2012). Theory construction in qualitative research: from grounded theory to abductive analysis. *Sociological Theory*, 30(3), 167–186. doi: 10.1177/0735275112457914.
- Toom, A. (2017). Teacher's professional competencies: A complex divide between teacher's work, teacher knowledge and teacher education. In D. J. Clandinin & J. Husu, (Eds.), *The SAGE Handbook of Research on Teacher Education* (pp. 803–819). London: SAGE Publishers.
- Toom, A., Lakkala, M., Männistö, T., Dexter, P., Salmela-Aro, K., & Kallunki, V. (2020). dLearn.Helsinki – The tool and service to support learning of teamwork competence (Invention Disclosure 970/2020). University of Helsinki, Finland.
- Toom, A., Pietarinen, J., Soini, T., & Pyhältö, K. (2017). How does the learning environment in teacher education cultivate first year student teachers' sense of professional agency in the professional community? *Teaching and Teacher Education*, 63, 126–136. doi: 10.1016/j.tate.2016.12.013
- Toom, A., Tiilikainen, M., Heikonen, L., Leijen, Ä., Mena, J., & Husu, J. (2019). Teacher candidate learning of action-oriented knowledge from triggering incidents in teaching practice. *Teachers and Teaching*, 25(5), 536-552. doi: 10.1080/13540602.2019.1652162
- Tynjälä, P., Beusaert, S., Zitter, I., & Kyndt, E. (2022). Connectivity between education and work: Theoretical models and insights. In E. Kyndt, S. Beusaert, & I. Zitter (Eds.), *Developing connectivity between education and work: Principles and practices* (pp. 3–14). Routledge. doi: 10.4324/9781003091219-2
- Virtanen, A., Niilo-Rämä, M., Pöysä-Tarhonen, J., & Häkkinen, P. (2019). Pitkittäistutkimus luokanopettajaopiskelijoiden suhtautumisesta yhdessä työskentelyyn [A longitudinal study on pre-service teachers' collaboration dispositions].

Kasvatus, 50(4), 342–355.

- Voogt, J., & Roblin, N. P. (2012). A comparative analysis of international frameworks for 21st century competences: Implications for national curriculum policies. *Journal of Curriculum Studies*, 44, 299-321. doi: 10.1080/00220272.2012.668938
- Wilson, L., Ho, S., & Brookes, R. H. (2018). Student perceptions of teamwork within assessment tasks in undergraduate science degrees. *Null*, 43(5), 786–799. doi: 10.1080/02602938.2017.1409334
- Yin, R. K. (1993). *Applications of case study research*. Newbury Park, California: Sage publications.
- Yliruka, L., & Karvinen-Niinikoski, S. (2013). How can we enhance productivity in social work? Dynamically reflective structures, dialogic leadership and the development of transformative expertise. *Journal of Social Work Practice*, 27(2), 191-206.