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Student teachers' and pupils' co-regulated learning behaviours in authentic classroom situations in teaching practicums

Emmi Saariaho ^{a,*}, Auli Toom ^a, Tiina Soini ^b, Janne Pietarinen ^c, Kirsi Pyhältö ^{a,d}

^a Faculty of Educational Sciences, University of Helsinki, Helsinki, Finland

^b Faculty of Education, Tampere University, Tampere, Finland

^c School of Applied Educational Science and Teacher Education, University of Eastern Finland, Joensuu, Finland

^d Faculty of Education, University of Oulu, Oulu, Finland

HIGHLIGHTS

- Student teachers' and pupils' co-regulated learning behaviours during teaching practicums were examined.
- Learning incidents student teachers' perceived positive included more proactive co-regulated learning behaviours.
- The more flexibly student teacher utilized regulated learning, more engaged pupils were in co-regulated learning behaviours.

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1. Introduction

Becoming a skilful learner is a collective rather than an individual journey (Schoor, Narciss, & Körndle, 2015). Regulation of learning is highly socially embedded per se and mere self-regulated learning (SRL) models have become inadequate for explaining learning in real-life learning situations (Boekaerts, 2011; Schoor et al., 2015). Accordingly, studying together in dyads or small groups has become one of the main-stream forms of instruction in contemporary classrooms (McCaslin, Sotardi, & Vega, 2015; Rogat

* Corresponding author. Faculty of Educational Sciences, University of Helsinki, University of Helsinki, P.O. Box 9 (Siltavuorenpenger 1B), 00014, Finland.

E-mail addresses: emmi.saariaho@helsinki.fi (E. Saariaho), auli.toom@helsinki.fi (A. Toom), tiina.soini@tuni.fi (T. Soini), janne.pietarinen@uef.fi (J. Pietarinen), kirsi.pyhalto@helsinki.fi (K. Pyhältö).

& Linnenbrink-Garcia, 2011; Schoor et al., 2015). However, so far, a limited number of studies have looked at teachers' actual behaviour when regulating pupils' learning (see e.g. Westling, Pyhältö, Pietarinen, & Soini, 2017; Kistner et al., 2010; McCaslin & Burross, 2011; Perry, VandeKamp, Mercer, & Nordby, 2002).

To promote co-regulated learning (CoRL) among pupils, future teachers will need to become experts in facilitating co-regulated learning during teacher education (McCaslin et al., 2015; Saariaho, Pyhältö, Toom, Pietarinen, & Soini, 2016). In addition to learning how to support pupils' regulated learning skills, student teachers' own regulation skills develop in the different environments of teacher studies, especially in teaching practicums (McCaslin et al., 2015; Saariaho et al., 2016). Hence, teaching practicums provide a central arena for learning such expertise, since student teachers learn what they can practice. However, to our knowledge, no previous studies have explored student teachers' and pupils' co-regulated learning behaviours during teaching practicum (Saariaho et al., 2016). Using video data, our study contributes to the literature on co-regulated learning by examining how student teachers and pupils co-regulate their learning in authentic classroom interaction during teaching practicums in situations that student teachers perceive as being significant when learning to become teachers.

2. Co-regulated learning in the classroom environment

2.1. Co-regulated learning

The regulation of learning, whether individually or with others, refers to intentional and goal-directed learning, when learning is guided by monitoring, controlling and evaluating cognitive, behavioural, motivational and emotional processes throughout the

learning situation (Hadwin, Järvelä, & Miller, 2011). Younger pupils in particular still need teachers or more advanced peers to support their self-regulated learning activities and development of self-regulation skills have strong social premises (Schunk & Zimmermann, 1997; Boekaerts, 2011). Therefore, the intentional *co-regulation of learning* is crucially important in schools where teacher–student interaction still plays a significant role in learning (McCaslin & Burross, 2011; Schoor et al., 2015). Co-regulated learning is typically referred to as a process in which the regulation of learning is temporarily distributed or shared between the learner and (usually) someone more capable – typically a teacher or peer – in a transition process in which the learner becomes a self-regulator (Hadwin et al., 2011; Hadwin & Oshige, 2011). On the other hand, co-regulated learning can also be a reciprocal process in which all participants intentionally regulate the learning for the benefit of themselves and others (e.g. each other's cognitive actions and emotional states), or to coordinate their actions having a shared purpose in mind (Järvenoja, Volet, & Järvelä, 2013; Winne, Hadwin, & Perry, 2013). However, the latter is particularly rare since it entails creation of shared knowledge output (Hadwin et al., 2011; Volet, Summers, & Thurman, 2009). In co-regulated learning, individuals make decisions and share thoughts together to combine different kinds of expertise and shared control of the task, and during the process all participants' self-regulatory learning skills develop although their learning goals and efforts might have been different (Hadwin et al., 2011; Hadwin & Oshige, 2011; Volet, Vauras, Khosa, & Iiskala, 2013). Co-regulation of learning takes place through constant cycles of joint forethought, performance, and reflection (see seminal work on regulated learning by Zimmerman, 2000). The cyclical nature of regulated learning refers to a process in which the student uses prior learning experiences when attaining the learning goals through proactive planning and monitoring, and further reflecting on these experiences and the effectiveness of methods used on in subsequent learning situations (Zimmerman, 2000; Zimmerman & Schunk, 2011). It comprises a cycle that includes: (1) joint goal setting, planning and analysing the task at hand, (2) joint monitoring and controlling the learning situation and use of diverse learning strategies, and (3) reflecting on the learning together (Hadwin et al., 2011). This includes co-reflection of achievement and the learning situation by looking back to it to improve learning activities in the future. However, it has been suggested that the regulation phases are not fixed but can overlap with each other and that co-regulation can also be fragmented in nature, such as, in upper-elementary pupils' collaborative learning tasks (Rogat & Linnenbrink-Garcia, 2011). Furthermore, co-regulation of learning is not easy or self-evident and it has been shown to be emotionally challenging, requiring advanced learning skills but still often remaining incomplete (Järvenoja & Järvelä, 2009, 2013; Volet et al., 2009). Still, the aim is to develop pupils' regulated learning skills to levels at which they can regulate their own and other's learning is desirable, even in demanding tasks in which goals and learning products are genuinely shared. This calls for the employment of co-regulated classroom practices that enable pupils to learn how to regulate themselves and others, and especially a teacher who is skilful in such practices. Yet, this requires that studentteachers learn how to apply co-regulation strategies to benefit their own learning and that of their pupils' during teacher education (McCaslin et al., 2015; Saariaho et al., 2016).

2.2. Co-regulated learning in the classroom

Research on socially regulated learning in the classroom has focused on co-regulated or shared regulated learning during

collaborative learning among elementary, high-school or college students (see e.g. Grau & Whitebread, 2012; Rogat & Linnenbrink-Garcia, 2011; Volet et al., 2009). Previous studies have detected considerable differences between the groups' abilities in high-level co- or shared regulation (Rogat & Linnenbrink-Garcia, 2011; Volet et al., 2009). The groups capable of synergic and high-level utilization of regulated learning (including planning, monitoring and behavioural engagement), were more successful in socially shared regulated learning and achieving their outcomes, compared with less-advanced groups which were able to regulate only one dimension at a higher level (Rogat & Linnenbrink-Garcia, 2011). High-level co-regulated learning is also associated with group members' ability to ask questions that lead them further, to their sensitivity to listen to each other, and their prior knowledge on the topic (Volet et al., 2009). In addition, a positive atmosphere and positive socioemotional interactions have been found to facilitate high-level co- and shared regulation (Rogat & Linnenbrink-Garcia, 2011; Volet et al., 2009).

But how can pupils be supported in learning to become high-level regulators who are able to manage themselves, and simultaneously co-regulate their own and other's learning, or even achieve shared regulation during challenging group work? The teacher's role in developing their pupils' ability for self-regulated learning and optimally socially regulated groups has been recognized (McCaslin et al., 2015). For instance, systematic and teacher-supported collaborative group work has been shown to be related to improvements in elementary school pupils' self-regulated learning skills and good group learning outcomes (Grau & Whitebread, 2012; McCaslin et al., 2015). Moreover, co-regulation has been associated with a warmer emotional tone of classroom interaction and increased on-task behaviours (Westling et al., 2017). There is also evidence that high-level self- or socially regulated learning in classrooms requires careful preparation and building optimal circumstances for it, including giving pupils challenging tasks to promote control over their learning and to provide opportunities to evaluate themselves and others (Westling et al., 2017; McCaslin & Burross, 2011; Perry et al., 2002). Teachers play a significant role in orchestrating such activities in the classroom. Their supportive presence and verbal explanations are important for co-regulated learning to be successful in terms of pupils' learning (McCaslin et al., 2015). Also, the strategies teachers apply in supporting pupils' self-regulated learning have been related to better learning outcomes in mathematics (Kistner et al., 2010). Yet a significant variation between the teachers occurs in their abilities to orchestrate optimal circumstances for the regulated learning (Kistner et al., 2010). Providing immediate and verbally understandable support for co-regulated learning activities in the classroom is a demanding task even for in-service teachers (McCaslin et al., 2015).

However, few studies have been conducted on student teachers' supporting pupils' regulated learning in classrooms. These few studies on the topic have focused primarily on student teachers facilitating pupils' self-regulated learning abilities, nor how learning together is regulated in the classroom (see e.g. Michalsky & Schechter, 2013; Perry, Phillips, & Hutchinson, 2006; 2008). The explicit guidance and support from teacher educators and teaching practicum supervisors are associated with the readiness of student teachers' to adopt teaching practices supporting pupils' self-regulated learning, but peers have also been found to affect the development of these skills (Michalsky & Schechter, 2013; Perry et al., 2006; 2008). During the teaching practicum student teachers not only help pupils to become skilful learners but they also simultaneously cultivate their own co-regulative skills. Our previous studies have shown that student teachers perceive co-regulated learning with peers and pupils in authentic classroom

environments as being a highly meaningful and instructive part of their studies (Saariaho et al., 2016, 2018). This further implied that co-regulation skills are best developed in an authentic classroom environment, i.e., in the teaching practicum. Yet we know little about the co-regulated behaviours student teachers and pupils employ in co-regulated learning during teaching practicums. Hence, our study takes one of the first steps in looking more closely at what happens in classroom interaction in terms of student teachers' and pupils' co-regulated learning behaviours.

3. Aim of the study

The aim of the study is to provide a better understanding of the emergence of co-regulated learning in student teacher – pupil interaction in authentic classroom situations during teaching practicums. The study focuses on analysing the types of co-regulated learning behaviours student teachers and pupils display in classroom interaction. Hence, the following research questions were addressed:

What characterizes the learning situations in which the student teachers' and pupils co-regulated learning behaviours are embedded in classroom interaction during teaching practicums in critical incidents chosen by the student teachers?

How do the student teachers and pupils co-regulate different dimensions of co-regulated learning behaviours during the critical incidents experienced in teaching practicum?

4. Methods

4.1. Finnish teacher education and teaching practicum

In Finland, all primary school teachers must have a master's degree in educational sciences, and these studies are usually completed in five years. Primary school teachers typically teach grades 1 to 6, when children are 7–12 years old, and usually have their own class in which they teach all school subjects in the curriculum. A primary school teacher master's degree (300 ECTS – European Credit Transfer and Accumulation System) includes orientation studies (25 ECTS), with the main subject being educational sciences or educational psychology (140 ECTS, including bachelor and master theses and teaching practicums 20 ECTS), multidisciplinary studies in subjects and cross-curricular issues taught in comprehensive school (60 ECTS) as well as minor and other complementary studies (75 ECTS).

The three teaching practicum periods included in the teacher education studies are (1) the orientating practicum carried out at the beginning of studies (at the end of the first year), (2) the multidisciplinary practicum focusing on the pedagogies of the different subjects carried out in the middle of the studies (during the third or fourth year), and (3) the advanced practicum focusing on the entirety of the teaching work, carried out at the end of studies (in the fourth or fifth year). However, student teachers start to get some teaching experience in their first semester when observing and interviewing teachers and pupils as part of their first courses in teacher education. At the same time, they become familiar with the classrooms they are going to teach in during the first practicum period held during the spring semester. Teaching practicum periods are organized both at the teacher training schools affiliated with the Faculty of Educational Sciences at the University of Helsinki or in regular schools belonging to the field school network of the Faculty of Educational Sciences.

Practicums are demanding and highly invested learning periods in which lessons are prepared with other student teacher(s) and with the classroom teacher, who is always present and supervises the practicum, but is not involved in teaching or disciplinary actions

during the lessons. The practicum periods are conducted in collaboration with other student teachers, meaning that two or three student teachers are responsible for planning and conducting the lessons as well as evaluating pupils together. Student teachers invest carefully in the lesson plans, and the times spent as the responsible teacher and assisting teachers are divided equally. The plan includes the roles and responsibilities of both the responsible teacher and the assisting teachers throughout the lesson, and the responsible teacher is oversees orchestrating the plan as well as being the leading teacher when it is her/his turn. The plans are always discussed with the actual classroom teacher, both before and after the lesson, meaning that teaching practicum periods are intensively supervised and organized.

In Finnish teacher education, student teachers complete several theoretical and practical courses about pupils' learning, their own learning and development as teachers, as well as general and subject-specific pedagogy. Accordingly, student teachers master theoretical and practical knowledge in teaching practicums and are aware of planning, conducting and evaluating lessons. Hence, self- and co-regulated learning and the practices related to them are among the themes taught to student teachers.

4.2. Participants

The participants were 43 primary school student teachers (female: 33, male: 10, age: 21–41 years, mean age: 26.3 years) who were at different stages of their studies. Eighteen of the student teachers (13 female, 5 male) were undertaking their orientating teaching practicum (at the end of the first year), 18 (14 female, 4 male) were carrying out their multidisciplinary teaching practicum (in their third or fourth study year), and 7 (6 female and 1 male) were in their final practicum period (advanced practice in their fourth or fifth year). The distribution of female (77%) and male (23%) students was typical of the primary school student teacher population at the teacher education institute at the time the data were collected.

4.3. Data collection

The data were collected during 2013 and 2014. The data consisted of video-recorded lessons in the primary schools where student-teachers were conducting their various teaching practicum periods (orientating, multidisciplinary or advanced) either in autumn or spring semester, but not during the early or late weeks of the schoolyear to make sure that the practicums would not distract these short but intense periods. The primary schools participating in this study were three schools in the capital area. Explicit and precise information about the study was given to all participants, and the permission to video-record and use the recordings for research purposes was obtained from all involved in the data collection, including student teachers, pupils, their parents and the school authorities (see e.g. Derry et al., 2010). First, the study was introduced and agreed upon with the supervising teachers at the practice schools. Then, the study was introduced to the pupils' parents and the permission to record their children during lessons was requested. Finally, the study was introduced to the student teachers who were about to carry out their teaching practicum in these classrooms, and their consent was also requested. The student teachers' participation in the study was voluntary, and not an obligatory or assessed part of the teaching practicum. No compensation for participating was given. It was also emphasized that withdrawal from the study at any time during the research process or later was possible.

The data collection utilized the “guided reflection” procedure (Husu, Toom, & Patrikainen, 2008). Guided reflection entails the

use of critical incidents in stimulating student-teachers to reflect on their teaching and learning in the classroom (Husu et al., 2008; Tripp, 2012). First the participants were asked to choose one teaching practicum lesson they would allow to be recorded. The lessons which participants chose to be video recorded varied and included mother tongue (Finnish), biology, mathematics, geography, arts, music, drama and Christian religion lessons. After the lesson was videoed, the participants received a copy of the recording, which they could watch at home within a couple of days. The participants were instructed to choose two critical incidents from the videoed lesson that they found to be a) positive and successful, and b) challenging, difficult or negative, in terms of their own learning. Only the critical incidents were used as data to analyse the student teachers' and pupils' co-regulated learning behaviours in authentic classroom interaction.

4.4. Analysis

Student teachers' and pupils' co-regulated learning behaviours during classroom interaction were analysed through the critical incidents chosen from the videoed lessons. Only the episodes chosen by the student teachers themselves, meaning the critical incidents considered to be either successful or challenging in terms of their teacher learning, were analysed. The analysis focused on co-regulated learning behaviours with pupils, and both inductive and deductive analysis protocols were applied. An inductive analysis was applied when analysing what characterized the learning situations in which student teachers' and pupils' co-regulated learning behaviours were embedded. A deductive content analysis strategy utilizing previous studies on teachers' critical learning incidents in teaching (Tripp, 2012) and socially regulated learning in classrooms (e.g. Grau & Whitebread, 2012; Kistner et al., 2010; Rogat & Linnenbrink-Garcia, 2011) was applied in the analysis of co-regulated learning dimensions. Accordingly, in terms of co-regulation dimensions, the video data were analysed according to systematic sampling to examine the specific and theoretically grounded research questions (see e.g. Derry et al., 2010).

The video analysis included three complementary phases. At first, the critical incidents identified by student teachers were extracted from the video recordings, i.e., the situations that the student teachers had found to be positive, meaningful and successful, or challenging, difficult and negative in terms of their teacher learning. In the second phase, all verbal interaction in each videoed incident was transcribed verbatim. Also, all non-verbal macro-level behaviour and interaction in the incident were transcribed in the same text file with the verbal interaction. The specific transcriptions of the critical classroom situations including student teachers' and pupils' verbal and non-verbal interaction and behaviour during the critical incidents were analysed more closely. Only the transcriptions in which it was possible to transcribe verbal interaction were chosen for the analysis. The data from six student teachers were omitted from the deeper analysis due to poor sound quality on the video recording or because of restless situation in the classroom, which made transcription impossible. There were also nine student teachers from whom only positive (seven students) or negative (two students) incidents were analysed more deeply due to poor sound quality. Also, two student teachers had chosen an ambivalent incident from the video, instead of a positive and a negative one, and one student teacher had chosen one positive and one ambivalent incident. Hence, 32 positive incidents, 28 negative incidents and 3 ambivalent incidents were accepted for deeper analysis. These incidents included varied situations in the classroom. During some incidents, the whole class was present (approximately 20 pupils) and some incidents included group work situations (number of pupils varying from 2 to 8 and, for instance,

one student teacher guiding the group, or two or three assisting student teachers in the classroom and offering their help to groups if needed). Hence, the number of pupils per student teacher varied in the critical learning incidents depending on the learning situation during the lesson.

Secondly, the transcriptions were categorized according to the time when they appeared in the lesson. A typical lesson lasts approximately 45 min and a double lesson lasts 90 min. In the analysis the lesson was divided into three segments: the beginning, the middle, and the end. The beginning of the lesson included the introduction of a new subject or the learning task and was the first 10–15 min of the lesson both in single and double lessons. The middle of the lesson, when the subject was covered, or the learning tasks conducted, started when the lesson had been going for about 10 min. In a single lesson, the middle part often lasted about 20 min and in double lessons it lasted longer, often for 40–50 min. The end of the lesson, when the learning tasks had to be finished or homework assigned, covered approximately the last 10 min of the lesson. However, the exact number of minutes spent on parts of the lesson was not crucial for the categorization but rather the overall characteristic of the situation.

Finally, in the third analysis phase, all incidents entailing co-regulated learning behaviours were coded into the three categories based on the quality of behaviours displayed. The student teachers' and pupils' co-regulated learning was interpreted from a synthesis of both verbal interaction and non-verbal behaviour (see also Grau & Whitebread, 2012; Rogat & Linnenbrink-Garcia, 2011). The student teachers' and pupils' co-regulated learning behaviours were coded in-to three categories 1) *co-planning* 2) *co-regulated strategy use*, and 3) *co-reflection*. The specific criteria utilized in the analysis were as follows:

- 1) *Co-planning* entailing verbalization and behaviours of: forethought and activation (i.e. activating pupils' previous knowledge, for instance by posing activating questions about the subject of the lesson), task analysis (i.e. analysing the task at hand: what it is about, what needs to be done), goal setting (i.e. setting goals for the learning task), and/or planning (i.e. planning how to proceed with the task, what learning strategies to use in the task and how to deal with the possible challenges faced during the task) in collaboration with pupils or with other student teachers.
- 2) *Co-regulated strategy use* comprising verbalization and behaviours connected to: monitoring the learning situation (i.e. active checking of the learning situation and instant responding when a change needs to occur), control (i.e. controlling one's own or the pupils' behavioural or cognitive actions and changing learning or disciplinary strategies when needed) and/or applying strategies (i.e. activating pupils to participate during the on-task phase and use of different learning or disciplinary strategies to support others' learning), in collaboration with pupils or with other student teachers.
- 3) *Co-reflection* consisting of verbalization and behaviours connected to: reflecting on the learning situation (i.e. reviewing what has just been done, evaluation of appropriation of the goals set for the task, evaluation of the behaviour connected to learning, giving feedback on the task, comparing learned facts to one's own experiences in terms of the learned subject and/or evaluation of the opportunities to apply the newly-acquired knowledge in the future) in collaboration with pupils or with other student teachers.

Twenty-five per cent of the data (randomly selected 11 student teachers' critical learning incidents including co-regulated learning behaviours) that went for deeper analysis was coded by another

member of the research group and the inter-rater agreement in terms of the regulated learning phases was 92%. In the few cases of disagreement, consensus on the final categorization of the dimension of co-regulated learning behaviour was reached through discussion among the researchers.

5. Results

Characteristics of the co-regulated learning behaviours embedded in the critical incidents in classroom interaction.

The analysis showed that the critical incidents during classroom interaction from the perspective of the student teachers included active and intentional co-regulated learning behaviours, such as forethought and activation, applying new strategies to support pupils' learning, monitoring and controlling learning, and occasionally, reflection of learning with pupils. However, differences in co-regulated learning between the incidents that student teachers considered either positive or negative were detected. The positive incidents entailed co-regulated learning behaviours more often than the negative ones. In fact, most of the positive incidents chosen for deeper analysis included co-regulated learning behaviours (81%), whereas co-regulated learning behaviours were utilized in over half of the negative incidents that were analysed in more detail (55%). In addition, two of the three ambivalent incidents including both positive and negative aspects entailed co-regulated learning behaviours. The incidents without co-regulated learning behaviours were characterized as instructive situations through which learning was directed by the student teacher and pupils listening being attentive or passive, or where no one was regulating the learning, i.e. the situation in the classroom

ended chaotically.

Some differences in where the positive or challenging incidents (including co-regulated learning behaviours) were situated during the lessons were identified. Positive incidents were emphasized at the beginning (11) and middle (14) of the lessons, and only one occurred at the end. The negative incidents were more equally distributed throughout the lessons: five at the beginning, five in the middle and six at the end of the lesson. In the cases of ambivalent incidents one was in the middle and one at the end of the lesson. Typical also was that the negative incidents were transitional situations at the middle of the lesson between the tasks, or when the task had to be finished at the end of the class (11 of 16 negative incidents had a transitional nature). Only one case of a positive incident was a transitional situation (See Fig. 1).

A difference between co-regulated positive and negative incidents in terms of the focus of the regulative activity was also noted: in the positive incidents involving co-regulated learning behaviours, the academic aspects of learning were emphasized, whereas in negative incidents including co-regulated learning behaviours the social aspects of learning were highlighted (i.e. classroom management). In other words, during positive incidents, student teachers were often able to keep their own and their pupils' focus on the learning task at hand. The positive co-regulated learning incidents entailed various student teacher-initiated intentional co-regulated learning activities characterized by a well-designed plan for introducing or carrying out the task. Typical of the incidents was that the student teacher behaved calmly and showed enthusiasm towards the subject or task, which further triggered pupils' active engagement in co-regulated learning, such as active forethought, monitoring or sometimes even reflection. On

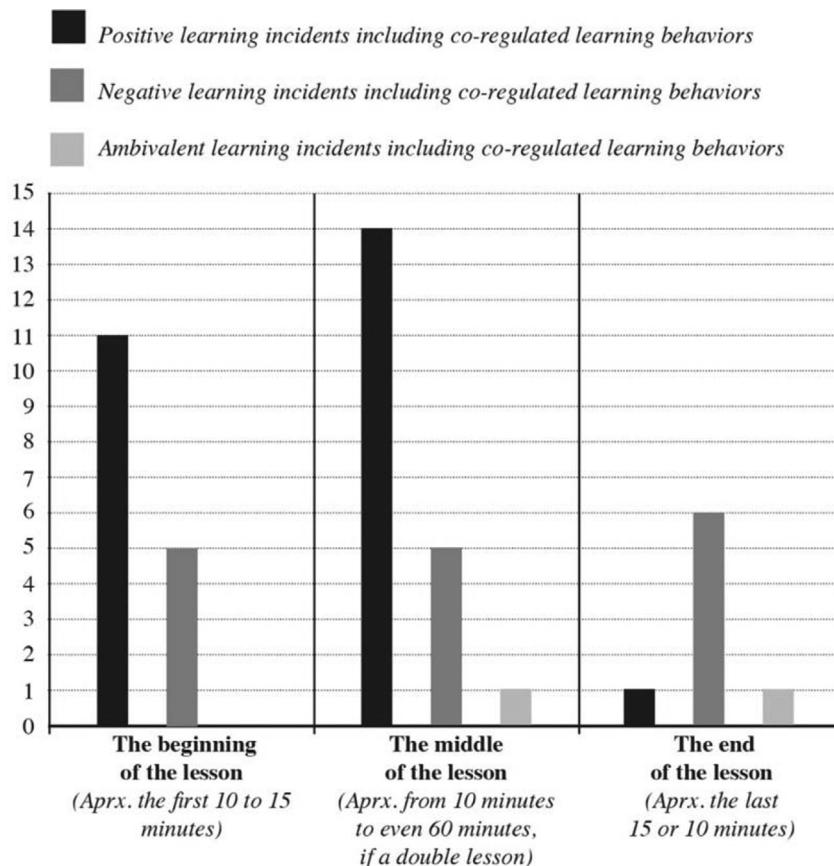


Fig. 1. Temporal location of the learning incidents including co-regulated learning behaviours in the course of the lesson.

the other hand, all negative incidents involving co-regulated learning were characterized by a restless atmosphere in the classroom caused by inadequate instructions given by the student teacher or difficulties in time-management, which triggered the student teachers' reactive attempts to solve the problems, or complete the task as planned. Typical of these incidents was that both student teachers and pupils were monitoring and controlling the learning situation and were focused on the task management.

Furthermore, student teachers' and pupils' co-regulated verbal interactions and macro-level non-verbal behaviours were intertwined during classroom interaction. Positive incidents including active and intentional co-regulation of learning included student teachers' enthusiastic but calm behaviour and movement around the classroom, most typically in front of the class. Student teachers' non-verbal behaviour included smiling, enthusiastic nodding and active moving of the body (e.g. pointing with hands), getting closer to pupils when asking them questions, intense eye contact with the responding pupil and actively moving about in front of the class. During positive learning incidents including co-regulated learning, pupils also showed their enthusiasm by moving in a lively way yet staying calm and concentrating on their own place. Pupils also showed their interest by eagerly raising their hands when the student teacher asked them questions. In terms of more private situations, for instance in discussion with pupils or when giving instructions in individual or group work, the student teachers tended to bend down to the pupils' "level" and establish close eye contact.

In the negative incidents, student teachers' and pupils' non-verbal behaviours were more typically tense due to the restless situations at certain points during the lessons. The student teachers smiled less, and sometimes looked quite worried when time was running out and pupils were still doing the task. Also, their body language was tense and frenetic: typically, student teachers had to move quickly back and forth in the class urging pupils to complete the task and to tidy up their table, while they still tried to convey the content of lessons. Typical also was that time problems led to less eye contact with the pupils than in the positive incidents. Pupils also behaved restlessly and nervously, and often began to turn around in their own places or move about the classroom chatting and laughing with each other or trying to get student teachers' attention. In many negative learning incidents, pupils' co-regulated behaviours were directed towards the student teacher and included demanding verbal and non-verbal behaviours concerning the task, at which the student teachers replied tensely and reactively trying to keep the situation under control.

5.1. Various dimensions of the co-regulated learning in student teachers' critical learning incidents

The further investigation showed that during the positive incidents, student teachers and pupils utilized co-regulated learning behaviours more diversely, with the emphasis being on forethought and activation, applying strategies as well as monitoring and control. Negative incidents including co-regulated learning, however, mainly involved co-regulated activities focusing on monitoring and controlling the learning activities.

Co-planning, particularly in the positive incidents, commonly entailed student teachers' and pupils' forethought, activation and task-analysis. Co-planning typically comprised introducing a new task or a new subject for the pupils at the beginning or middle of the class, resulting in the pupils becoming excited and motivated to participate. Characteristic of these situations was that the student teachers activated pupils to participate (i.e. asked questions), encouraged them to think aloud using their previous knowledge of the subject or task, or analysed together how to carry out the task.

An interesting topic and enthusiastic atmosphere often further triggered pupils to enthusiastic and lively forethought of the subject, which in turn gave new insights to the student teacher. In the incidents including versatile and active forethought and activation, the interaction between the student teacher and pupils was typically lively and most of the pupils were trying to participate in the conversation and give their own comments and insights about the subject or the task. However, explicitly co-regulated goal setting and planning were employed only rarely in the critical incidents. Setting goals for the learning task and planning how to proceed were dominated by student teachers giving the information, and rarely were pupils actively involved in these phases of the learning task.

Student teachers employed *co-regulated learning strategies* in both positive and challenging (i.e. more negative) critical incidents during the lessons. During positive learning incidents, the student teachers, for example, monitored the learning situation and applied diverse strategies such as re-directing pupils' attention back to the subject or task in cases in which pupils were not concentrating. Student teachers were also sometimes innovative in difficult moments and were even able to take on a different role or view the task or the subject from a different angle. In positive incidents pupils were also engaged in monitoring and controlling the situation during the learning task. Moreover, in these situations, both student teachers' and pupils' co-regulated activities were generally more focused on the task at hand and on acquiring knowledge and learning new skills. During the negative incidents, monitoring and control were most commonly utilized to regulate pupils' unfocused behaviours during the learning tasks, guide their behaviour and direct them back to the learning task, in collaboration with other student teachers or with pupils. Student teachers, for example, directed pupils towards understanding the instructions to complete a task or finishing the task if they were on the wrong track. In addition, in some incidents the pupils were involved in co-monitoring and controlling each other's behaviour with the student teacher. The strategies used by the student-teachers in negative incidents were characterized by quick solutions to restlessness or otherwise problematic situations when the pupils were not paying attention to the task at hand, or had lost track of when it was time to move on to the next task or finish the ongoing task, including student teachers using hands-on -strategies to help individual pupils or a pupil group. Furthermore, monitoring and controlling were typically intertwined, and noticing, for example, that someone answered incorrectly was followed by quick intervention, i.e. a comment concerning the learning task or behaviour connected to learning from a student teacher or another pupil.

The results showed that student teachers rarely employed active and prospective *co-reflection* in co-regulated learning activities during lessons. Co-reflection was typically characterized by retrospective nature, i.e. focusing on rehearsing what had been learnt or was the learning task conducted as it should have been, instead of explaining how to deepen or utilize the knowledge acquired and skills in the future. The few incidents including active and future-oriented co-reflecting on learning, however, were characterized by an intense focus on learning complemented by an enthusiastic atmosphere in which both the student teacher and pupils were highly involved in new learning. In these situations, the pupils showed enthusiasm and curiosity towards the new subject, such as how human lungs function, triggering reflective thinking about their own breathing in different situations, which further triggered the student teacher to ask the pupils associated questions thus questioning their everyday thinking about breathing. In particular situations, co-reflection was characterized by pupils presenting spontaneous questions and comments concerning the learning topic that the student teachers utilized as an opportunity to deepen

the co-reflection by encouraging pupils to reflect on how to use newly-acquired knowledge also in the future. Furthermore, the few incidents during which high-level co-reflection occurred were characterized by versatile regulation activities, i.e. intentional and highly intense co-planning by student teachers (e.g. forethought and activation) and co-strategy use (e.g. active monitoring). They were also calm, joyful and highly focused on facilitating the pupils' peer interaction. In the negative incidents, co-reflection typically occurred at the end of the lesson when pupils were behaving restlessly, were puzzled about what to do next, or were unsure if they had completed/understood the task correctly, with the student teacher trying to re-direct the pupils' attention to the learning task using reactive and fast reflection, asking questions about their progress or checking their understanding of the subject. However, in most of the incidents including co-reflection the student teacher and pupils reflected on mainly retrospectively the overall progress of the learning situation, i.e. if the group task had been conducted in a way that had supported learning or if the learning task had been inspiring. Furthermore, few situations in the negative learning incidents when pupils attempted to reflect on what they were learning, or on what they had previously learned, were missed or even ignored by student teachers. See Appendix 1 for two authentic, above mentioned, learning incidents from the lessons, one positive and one negative.

Our results further revealed that co-regulated learning activities in student teachers' and pupils' classroom interaction were typically spontaneous, overlapping and fragmented. In few incidents was co-planning clearly followed by co-strategy use; in most cases, co-regulated learning activities were utilized simultaneously, overlapped, or changed back and forth between co-planning and co-strategy use, and sometimes to co-reflection. On the other hand, there were also incidents in which only one dimension (such as monitoring or controlling) was displayed particularly during the negative incidents.

To sum up the results, in the positive incidents including co-regulated learning behaviours, the focus of learning was typically more intensely on-task, co-regulated dimensions were utilized in a versatile way and the student-teacher's verbal interactions and non-verbal behaviours were sensitive in pupils' regulated actions, comprising a well-structured and emotionally positive learning situation. In the negative incidents, on the other hand, the focus of learning was typically on task management, co-regulation activities were more reactive, and verbal interactions and non-verbal behaviours being tense, comprising a restless situation causing a negatively toned atmosphere. However, common to both the

positive and negative learning incidents including student teachers' and pupils' co-regulation was that they were both active in the regulation behaviours. Hence, the results revealed that in both positive and negative learning incidents, the co-regulation was reciprocal in student teachers' and pupils' behaviours, although in the positive incidents in a more proactive and emotionally harmonic way.

See Table 1 for the qualitative differences between different dimensions of either positively or negatively experienced co-regulated learning incidents.

6. Discussion

6.1. Methodological reflections

Teachers' contributions to pupils' learning and the diverse social learning situations in the classroom play a key role when pupils learn how to regulate their own and others' learning processes. However, there has been limited amount of research on how student teachers and pupils together regulate their learning in the authentic classroom context, although it is likely that the basis of future teachers' ability to actively use co-regulated learning strategies and to support of pupils' regulation skills will be formed during their teacher education (Saariaho et al., 2016). Our study contributes to the research field of co-regulated learning, as it is among the first to take a deeper look at student teachers' and pupils' actual co-regulated behaviours in authentic classroom settings. However, the study has some limitations. Based on video data, carefully considered and well-grounded data selection played a fundamental role in the study, because the data set included enormous amounts of video material from which we carefully selected what would be used for deeper analysis (see e.g. Derry et al., 2010). Hence, our methodological decision was to analyse only those parts of the video data that the student teachers themselves considered to be meaningful in terms of their teacher learning. This decision resulted in an intense and eventful set of data, including points experienced by the student teachers as well as complicated and challenging situations during the lessons. However, the length of these incidents, varying from a couple of minutes to 20 min means that a large part of the data, possibly including active co-regulated learning behaviours, was left out of the analysis.

Furthermore, during teaching practicums the actual teacher of the classroom is present, although not participating in teaching. However, in this study, the classroom interaction of student

Table 1
The dimensions of co-regulated learning behaviours.

Dimensions of co-regulation	Co-regulated learning behaviours	
	Positive incidents	Negative incidents
Forethought & activation, task analysis, goal setting, planning	Enthusiastic, lively interaction, encouraging, reciprocal, task focused	Student teacher -initiated, rigid
Monitoring, control, applying strategies	Calm and concentrated, lively interaction, proactive and innovative, reciprocal task and learning focused	Tense, reactive, reciprocal, management-focused
Reflection of learning	Calm lively interaction, proactive, reciprocal, task and learning focused	Rigid, reactive, behaviour-related

teachers and pupils was at the core, and it is hard to say if it differs from the situations in which pupils are with their regular teacher. Thus, further studies should also be conducted on in-service teachers' and pupils' co-regulated learning behaviours during authentic classroom interaction.

In addition, long-term data collection concentrating on the same student teachers throughout their teaching practicum period would have offered a wider perspective on the student teachers' and pupils' co-regulated learning behaviours in different phases and during different lessons in the teaching practicum. More research on co-regulated behaviours in the classroom is needed from a longitudinal perspective, as well as on student teachers' and pupils' own perceptions on the co-regulated behaviours they use during lessons.

6.2. Theoretical reflections

The overall results of this study on student teachers' and pupils' co-regulated learning behaviours in authentic classroom interaction showed that student teachers and pupils actively co-regulate their learning in classroom interaction in versatile situations throughout the lesson, which confirms that co-regulated learning has also a reciprocal nature (see also Hadwin et al., 2011; Järvenoja et al., 2013; Volet et al., 2013; Winne et al., 2013). Characteristics of the positive and negative learning incidents including co-regulated learning behaviours were that both student teachers and pupils were actively participating and involved in the interaction, i.e. the instruction during the lessons was not only externally regulated by the student teacher and that pupils participated in regulation of learning when they were encouraged to do it, or even spontaneously. Moreover, the results implied that the socioemotional atmosphere is a central determinant of co-regulated behaviours (see also Westling et al., 2017).

First, the results showed that positively perceived learning incidents included more versatile proactive co-regulated learning behaviours in student teacher – pupil interaction than the negative incidents. Co-regulated learning in the positive incidents was characterized by high-level and synergic regulation activities concentrating on the regulation of content understanding, whereas in negative learning incidents, low-level regulation activities and behavioural regulation concentrating on the behavioural aspects of learning were emphasized. Also, the tone and the focus of co-regulation differed between the negative and positive incidents. In positive co-regulated learning incidents, student teachers were able to maintain or adapt the focus of co-regulated learning according to the task at hand, despite the possible distractions or slight difficulties in the classroom atmosphere. In negative incidents, on the other hand, the co-regulated learning behaviours focused on task management and buffering distractions in complicated learning situations with pupils.

Second, the positive co-regulated incidents occurred mainly at the beginning or in the middle of lessons, whereas the negative incidents were distributed more evenly throughout the lessons. A reason for this might be that both the student teachers' and pupils' alertness is better for learning at those times. The negative incidents were typically situated in transitions within the lesson when the student teachers had the challenges of getting pupils to shift between tasks or to finishing the tasks, or they had problems finishing the lesson smoothly because of the problems in time-management. In such incidents, co-regulated learning behaviours became less sensitive and reciprocal behalf of the student teacher, shifting from intentional and proactive towards more reactive in order to solve the problem(s) as quickly and efficiently as possible. Making immediate choices in line with the lesson's plan within a

limited amount of time in a challenging situation may be overwhelming for student teachers resulting in reactive regulation strategies (see also Westling et al., 2017). Supporting pupils to regulate learning actively and intentionally is not an easy task for teachers at the beginning of their career, as classrooms are full of children's bubbling energy and concentrating on learning is quite demanding for pupils during long lessons and much new knowledge and many skills must be adapted. Concentration requires executive functions, i.e. cognitive control processes that mediate attention and memory (St Clair-Thompson & Gathercole, 2006; Kaplan & Berman, 2010). To be able to stay attentive and to memorize new facts is demanding for everyone, especially for young children. Furthermore, recent studies have found that executive functions and regulation of learning share the same resources when learning which implies that in some situations these processes might deplete each other (Kaplan & Berman, 2010). This could occur when conducting demanding tasks while there is a restless atmosphere or transitional situation in the classroom. Our results also shows that for teachers at the beginning of their careers, noticing and taking into account all the processes affecting their pupils' concentration and regulation might be quite demanding.

Third, our study showed that both verbal interactions and macro-level non-verbal behaviours had different tones in positive and negative co-regulated classroom incidents. This implies that both verbal interactions and non-verbal behaviours are intertwined and closely interrelated in the emotional atmosphere of the classroom. In positive incidents, verbal interactions included more explanations about the task content, and non-verbal cues were calmer and task related. In the negative incidents, on the other hand, the student teachers were typically tense and the pupils restless, which disrupted the co-regulated activities concentrating on task content, and changed verbal interactions into concern behaviours about the learning task. The results indicated that the socio-emotional atmosphere of the learning situation affects both the quality of verbalizations of the co-regulated activities and the non-verbal behaviour (see also Rogat & Linnenbrink-Garcia, 2013). Teacher–pupil–interaction is reciprocal and influenced by both the teachers' and pupils' personal characteristics and the class environment, which further affects the learning situation and the overall learning atmosphere resulting in a well-controlled or sometimes a restless situation (Wubbels et al., 2015). Situations in which pupils suddenly become restless and lost their concentration placed high demands on student teachers' co-regulation abilities to get the pupils' behaviour back on track and keep both verbal interaction and behaviour in balance. On the other hand, such moments also highlighted the potential of co-regulation: if the student teacher was able to facilitate the co-regulation challenge, it typically enhanced the positive emotional tone of the situation.

Fourth, several differences between positive and negative learning incidents in terms of how the dimensions of co-regulated learning utilized in the classroom interaction were detected. *Co-planning* was more typically employed in the positive incidents, probably because the incidents occurred more often at the beginning or in the middle of the lesson when the grounding for the lesson was set, and typically included forethought and activation or analysing the task. Explicit co-regulated planning and goal setting with the pupils was somewhat rare. However, student teachers employed a range of co-regulative strategies, such as monitoring and controlling in both negative and positive incidents. Diverse strategy use in rapidly changing learning situations was mainly student teacher initiated, whereas in monitoring and controlling also the pupils were highly active and commonly participated. This further helped student teachers to control the learning situation with the help of the pupils if there had been problems with some

pupils' concentration when participating in a learning task. Monitoring and controlling learning are important elements in studying, because they enable learning to take place and keep it on track particularly when distractions arise (Zimmerman, 2000). Still, if co-regulation is reduced to controlling strategies only, important resources for cumulative learning are dismissed. Accordingly, our study revealed that *co-reflection* was rarely employed in student teachers' and pupils' co-regulated learning behaviours. Student teachers might perhaps find co-reflection more challenging in classroom interaction than forethought or control (Heikonen, Toom, Pyhäntö, Pietarinen, & Soini, 2017). Furthermore, the reason why some elements of co-regulated learning, especially control, were often found in both student teachers' and pupils' co-regulated behaviour might be because it is seemingly behavioural regulation in which participants in the situation make an effort to keep the focus on the task and avoid distractions, whereas planning, monitoring and evaluation (i.e. reflection) have been seen as cognitive regulation across regulation models (see e.g. Rogat & Linnenbrink-Garcia, 2011). Our study, however, showed that during co-regulated learning, both student teachers and pupils seemingly monitored the learning situation and reacted rapidly by applying a new strategy (typically student teacher initiated behaviour) or by controlling the learning situation (in which both student teachers and pupils were active). A reason why co-strategy use was emphasized over co-planning and co-reflection might be that the former enables directly keeping the focus on the task, while the latter activities are more future-oriented. However, co-reflection also seemingly existed in student teachers' and pupils' co-regulated behaviours, although it was rarely applied. Reaching deeper levels of co-reflection would require student teachers to pay specific attention to engaging pupils to reflect on what they had learnt, how it was learnt, and how learning could be improved in the future. Despite the limited number of incidents including co-reflection, the detected incidents revealed that co-reflection has the potential to reach both retrospective and prospective levels, including what has been learned and how, how student teachers and pupils have experienced the learning situation and how what has been learned could be utilized in real-life. Co-reflection was in fact more common in the positive learning incidents including active and versatile co-regulated learning behaviours which implies that it can be part of high-quality learning also when learning is characterized as successful and not only when learning clearly needs to be improved. The study showed also that in a classroom environment where situations and the atmosphere of lessons can change rapidly, the phases of regulation moved back and forth during both the positive and negative incidents, which confirms the over-lapping and sometimes fragmented nature of co-regulated learning behaviours (see also Rogat & Linnenbrink-Garcia, 2011). Hence, our findings imply that co-regulation is not always as well organized as the theoretical model suggests (see e.g. Zimmerman, 2000), but can often be utilized creatively in dynamic classroom interactions. However, further studies from a longitudinal perspective on the same (student) teacher and pupils should be conducted to understand better how learning of a subject, for instance, the multiplication table, is cyclically co-regulated over a longer period of time.

Finally, our results revealed differences between the incidents including active and versatile co-regulated learning behaviours, typically taking place in positive incidents, and more one-sided co-regulating behaviours typically situated in negative incidents. The finding is in line with previous research suggesting that successful co- or shared regulated groups tend to utilize different regulatory processes for different purposes (Rogat & Linnenbrink-Garcia, 2011; Volet et al., 2009). Previous findings have shown that groups that were able to achieve synergy in the social regulatory

processes such as planning, monitoring and behavioural engagement, were successful in attaining their goals (Rogat & Linnenbrink-Garcia, 2011). Our findings similarly confirm that the more flexible and versatile student teachers were able to be in utilizing co-regulation, more engaged pupils were in these co-regulated behaviours. Yet, there were variations between the student teachers in their ability to orchestrate co-regulation, and successful orchestration of co-regulation was characterized by student teachers' high sensitivity towards pupils' behaviour and ability to channel it towards co-regulation (see also Westling et al., 2017; Volet et al., 2009). Hence, the findings imply that teachers have an important role in facilitating and even modelling active and intentional co-regulated learning behaviours in classrooms. Yet it demands active effort to support the development of pupils' regulated learning, for instance by providing opportunities for participating in complex and open-ended activities, along with transparency in using the different dimensions of regulation (Kistner et al., 2010; Perry et al., 2002). This also places demands on how clearly a teacher is able to explain verbally and behaviourally what the task is and how it should be done, in order for the pupils to have the opportunity to concentrate on it (McCaslin et al., 2015). The results suggested that some student teachers were more capable of using understandable language and staying calm and thus support the co-regulated behaviours of pupils.

Hence, our results show that it is possible to engage pupils in high-level co-regulated learning behaviours, when the overall atmosphere of the lesson includes positive socioemotional interactions, engaging pedagogical practices as well as transparent and clearly verbalized regulation opportunities which trigger pupils' participation in the regulation of learning (see also Rogat and Linnenbrink-Garcia, 2011; Westling et al., 2017). Our results on student teachers' and pupils' actual co-regulated behaviours in classroom further indicate that the tricky moments at the beginning of the task, transitional situations between tasks or at the end of the lesson, are crucial for the situation to be experienced as positive or negative on behalf of student teacher. Pupils seem to become restless easily if there is even a short moment of confusion about what is coming next. This can further trigger student teachers' reactive attempts to re-engage pupils with the task, and easily co-regulated behaviours become less reciprocal or they change in to external regulation (Heikonen et al., 2017; Westling et al., 2017). The feeling of not having the control or dissonance in co-regulation might then cause negative feelings in the student teacher, which might also strengthen negative emotions among pupils (Pekrun, Muis, Frenzel, & Goetz, 2018). Our findings, however, showed that the restless atmosphere in the classroom also evolves easily when conducting the task, as occurred in many positive learning incidents, but if the student teacher was able to utilize proactive co-regulation strategies and re-engage pupils with the task and get the situation under control with the pupils, it triggered a positive emotional tone about the situation, a sense of efficacy as a teacher and a perceived successful learning situation in teacher learning.

6.3. Educational implications

Our study showed that providing optimal circumstances for co-regulated learning requires well-planned, well-constructed and stimulating learning tasks together with student teachers' calm, secure and active behaviours in engaging pupils in co-regulation. Thus, creating a setting for high-quality co-regulation in student teachers' and pupils' classroom interaction is possible, but for teachers at the beginning of their teaching careers, it is a highly demanding task that requires teacher educators to provide a good deal of knowledge and support (see e.g. Perry et al., 2006).

Furthermore, teaching practicum periods gives student teachers fruitful opportunities to learn from practice about how to co-regulate pupils' learning in authentic classroom situations. Teaching practicums also offer good opportunities for student teachers to become aware of and learn from pupils: our study has shown that pupils are also active agents in the classroom and when encouraged and supported, they eagerly participate in co-regulated learning behaviours during lessons. Hence, our study widens the perspective of what occurs in the classroom between student teachers and pupils when learning is regulated, and shows that regulation is also reciprocal, not only a one-sided scaffolding of pupils' self-regulation skills (see e.g. Perry et al., 2006; 2008). Still, student teachers cannot benefit from their practicum periods if they are unaware of what is happening in terms of co-regulated behaviours, which needs to be more clearly explained and analysed during teacher studies. Furthermore, recognizing the strengths as well as areas of development in student-teachers' co-regulation skills offers teacher educators valuable tools when guiding student teachers to use co-regulated learning activities during classroom interaction. There were a few situations in our study in student teachers' critical learning incidents when pupils tried to actively co-regulate by monitoring and even reflecting on the learning situation, but the student-teacher did not "catch" these pupils' participation. Furthermore, according to Steinbach and Stoeger (2016), the more positive the primary school teachers' attitudes towards self-regulated learning are, the more likely they are to see the application of systematic and intentional regulation dimensions in the classroom. Accordingly, our findings suggest that student teachers could benefit from more intense, transparent, systematic and multifaceted support for learning co-regulation skills during

teacher education, to be able to implement co-regulated learning practices in the classroom effectively. Learning to analyse classroom interaction in detail, and the strategies to regulate pupil learning in interaction should be clearly and explicitly emphasized in multiple ways throughout teacher education, with the help and modelling offered by teacher educators, as well as by practising it with peers in the academic and formal settings of teacher education. If student teachers learn how to co-regulate their learning and become more aware of active co-regulated learning at the beginning of their teacher education, they would be more likely to succeed in constructing the kind of classroom climate that fosters their pupils' self- and co-regulated learning activities and enables the development of pupils' regulated learning skills.

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Appendix.A

Positive learning incident in the middle of the lesson: a situation where co-regulation dimensions are used versatily

Time and macro-level behaviours

17.00. The student teacher (=ST, female) has helped pupils to go and sit around a table and they start to do a task concerning human lungs. There is some noise in the area and pupils are talking. The student teacher is standing on the right side of the table and is bent over the pupils as she starts the task. Girl 3 answers the question and shows where the lungs are. The student teacher demonstrates the girls' answer by using her hands.

17.08. The student teacher bends down closer to the pupils, continues with a question and Boy 2 answers. The student teacher confirms and demonstrates again by using her hands.

17.38. While the student teacher is still speaking, Boy 1 raises his hand and asks a question, the student teacher listens and answers. At the same time the student teacher grabs pencils from another table, then turns back towards the pupils and leans over them. The pupils are now listening quietly and concentrating.

18.08. The student teacher hand out the blue pencils and calmly and clearly tells the pupils what they have to do next. Boy 1 asks a clarifying question and the student teacher nods to him. The pupils start to colour with the pencils, and Girl 3 asks about how to do the task, and student teacher answers her. Then Girl 3 asks two more clarifying questions, the student teacher nods in response to the first and answers the second.

19.10. The student teacher asks that the pencils be put back on the table and moves on to tell about what they will to do next. When Boy 1 asks a clarifying question

Verbalization and the dimension of co-regulated learning

ST: okay now we are at the lungs-task point (.) let's remember a little where the lungs are (FORETHOUGHT & ACTIVATION)

Girl 3: here (FORETHOUGHT & ACTIVATION)

ST: here (.) when we had the skeleton lesson so what was it that protected the lungs (.) Boy 2 (FORETHOUGHT & ACTIVATION) Boy 2: the chest (FORETHOUGHT & ACTIVATION) ST: the chest which means that from here back and the front chest protects the lungs and with the help of lungs humans stay alive because then they can breathe (.) yes (FORETHOUGHT & ACTIVATION)

ST: and now first we'll speak about (.) what do you have in mind Boy 1 Boy 1: what if half of someone's lungs were taken away (.) my uncle half cut out (FORETHOUGHT& ACTIVATION)

ST: sometime one may need to go to on a breathing machine which means that a machine breaths for you for example if you have been in a big accident (FORETHOUGHT & ACTIVATION)

Boy 1: yeah I think I know

ST: first (.) you don't have even your names there so write your names there (.) up there if the paper happens to get lost (.) so we have the first task (.) colour the lungs in blue (.) and where are the lungs on the paper (TASK ANALYSIS)

Boy 1: did I put my name right

ST: you don't have to write just colour (.) where are the lungs in the picture (TASK ANALYSIS)

Girl 3: here (TASK ANALYSIS)

ST: yeah around there (.) you don't have to colour the heart yet but it is there in the middle and there around it are the lungs and you can colour them in blue (TASK ANALYSIS)

Girl 3: do you mean these (MONITORING)

ST: it doesn't matter if it goes a bit over (CONTROL)

Girl 3: is this name okay (.) I can't write it

ST: yeah

ST: and when you have finished you can put the blue pencil back here in the middle of the table (.) and now this was not all we have to do (.) now we listen to each other's

(continued on next page)

(continued)

- about the task, the student teacher bends down to the pupils, asks an activating question to which Girl 3 answers, and demonstrates by her using hands how the task about listening to the lungs should be done. Girl 3 participates by showing how to breathe quickly and the student teacher uses it as an example.
- 20.00. The student teacher stands up straight and shows the pupils the order in which to conduct the task. Pupils immediately starts the task. One of the pupils (not visible on the videotape) makes a clarifying comment how they should breathe in the task. Student teacher continues instructing the pupils and shows the sides of her own body, then sits down. The pupils continue with the task.
- 20.58. The student teacher stands up and tells the pupils to switch roles with each other. The pupils seem enthusiastic about the task. Girl 3 supportively slaps her partner's back.
- 21.33. The student teacher bends down to the pupils' level and moves on to the next task on the paper. The pupils are chatting a bit after the previous active part of the task. The student teacher demonstrates by putting her hands on different parts of her body.
- 22.40. The student teacher suddenly comes up with a new way to show how the chest moves when someone is breathing. She asks Boy 1 to try, and the boy goes lying on the floor and tries. The student teacher stands up and puts a sheet of paper on the chest of the boy. Girl 3 stands up to watch, others are sitting at their places watching and concentrating.
- 23.00. Girl 3 goes and grabs the paper and takes it back to the table although the student teacher has not asked her to do it so, the student teacher laughs a bit. Then the student teacher walks back to the table and stands still while talking to the pupils.
- 23.40. The student teacher bends down again to the level of the pupils. Girl 1 asks a spontaneous question which actually is connected to the next question on the paper. The student teacher uses the girl's question when moving to the next question of the task. The pupils are concentrating on the task and participating actively.
- lungs and breathing (TASK ANALYSIS)
 Boy 1: how (TASK ANALYSIS)
 ST: so that (.) where have your lungs been sometimes listened to (.) where have your lungs been listened to Girl 3 (FORETHOUGHT & ACTIVATION)
 Girl 3: at the doctor (FORETHOUGHT)
 ST: at the doctor right and there they have equipment for it (.) but we don't have that here now but we have our own ears so (.) now ask the one who is sitting beside you that they first breathe just normally (.) then listen (.) now first listen to what I'm saying (.) then you have to breathe very quickly (.) like a dog (.) you can even open your mouth and listen how the breathing sounds from the back (.) and Boy 1 listens (.) put your ear on your partner's back (TASK ANALYSIS)
 ST: Boy 2 listens from you (.) Boy 1 from Girl 2 (.) Girl 1 from Girl 4 and then we wait for a while that Boy 3 gets also to listen (PLANNING)
 Some of the pupils: normally (CONTROL)
 ST: first normally (.) and observe yourselves (.) is something moving when you are breathing and what parts (MONITORING)
 Boy 2: I hear humming (MONITORING)
 Some of the pupils: we can also do like this (CONTROL)
 ST: yes you can (.) now listen to Girl 4 also (CONTROL)
 Boy 1: I can't hear anything (MONITORING)
 Boy 2: I hear louder humming and also some beating (MONITORING)
 ST: yeah (.) and now we change (CONTROL)
 Boy 1: same as with Boy 2 (CONTROL)
 ST: change again so that Girl 1 listens Boy 2 and keep your (.) try like very deep (CONTROL)
 Girl 3: good boy (CONTROL)
 ST: and then when you are done (.) take task number three and you need to find answers to it (.) did you hear what I'm saying (.) (CONTROL) so task number three is what moving when I breathe (.) is the chest moving (.) are the sides moving (.) what about the belly (.) and shoulders and the you put a mark on the right places on the paper (TASK ANALYSIS)
 Girl3: what about [could not be transcribed]
 ST: so probably the chest is moving right (.) and you can try it the other way by laying there on the ground on your back (.) and by putting one of those papers on your chest (.) do you want to try Boy 1 (APPLYING A STRATEGY)
 Boy 1: yes
 ST: you'll show us (.) so this is how we put a paper on Boy 1 (.) and now breath (.) is the paper moving (MONITORING)
 Boy 1: it is (MONITORING)
 ST: the paper is moving (MONITORING)
 ST: and do you know what (.) especially when women are breathing they are breathing so called clavicle breathing (.) do you remember when we were talking about the clavicles
 Boy 1: yes here ouch
 ST: and only these are moving (.) but it is not a very good thing (.) because then not enough air gets in the lungs because the lungs are big and you should fill them with air so that you can move and run
 Boy 1: my friend has broken his clavicle
 ST: mmm
 Girl 1: why can I move and run although I'm breathing (REFLECTION)
 ST: but you are breathing (.) that is the reason why you can run and move (.) but hey that's our next question (.) three b (.) what strengthens my lungs (APPLYING A STRATEGY)
 Boy 1: where is three b (.) what strengthens my lungs (.) what does it mean (MONITORING)
 ST: three b (.) what strengthens my lungs
 Boy 1: breathing
 ST: but (.) breathing but what kind of breathing (APPLYING A STRATEGY = ACTIVATING DURING ON-TASK PHASE)
 Boy 1: deep
 ST: deep and kind of shortness of breath isn't that right (.) when you run and move so that you get short of breath (.) shortness of breath is the other word and overall what also strengthens (.) that is good
 Boy 1: what about running (REFLECTION)
 ST: and running (.) moving (.) all possible sports right (REFLECTION)
 Girl 3: what else (APPLYING A STRATEGY = ACTIVATING DURING ON-TASK PHASE)
 Girl 2: soccer
 ST: and lungs of athletes (.) they have really big lungs (REFLECTION)
 Girl 1: I'm also an athlete
 Boy 1: me too
 Girl 3: me too
 Boy 2: I'm not
 ST: you will get big lungs and it is really good that you strengthen them already when you are young (REFLECTION)
 Girl 4: I belong to swimmers in my hometown
 ST: swimmers have such good lungs because they have to be able to stay a long time under water (REFLECTION)

(continued)

25.07. The student teacher spontaneously starts to tell about the lung meter and inhales a lot of air, the pupils follow her and do the same. The pupils are still very focused on the situation and active.

Boy 1: I play soccer
 Boy 3: me too
 Girl 1: I go to gymnastics three times a week
 ST: and then do you know that in upper elementary school
 Boy 2: I don't do any sports
 ST: I don't know if you have one here in this school but in upper elementary schools you get to blow in to-this a lung meter (APPLYING A STRATEGY)
 Boy 2: oooh
 ST: then you get to see how big lungs your lungs are (.) but you can practice it already now by taking as much air in your lungs as you can (.) and then blowing it out little by little (.) just like that (.) or when you are swimming you can try how long you can be under water (APPLYING A STRATEGY)
 Girl 4: we do just like that when we have flippers on and then have to be under water (REFLECTION)
 ST: yes there under (.) and singers also need to have quite big lungs and they had to (REFLECTION)
 Girl 4: I'm also in singing in a choir (REFLECTION)
 ST: well now you see you have many things that can make you (.) short of breath and moving strengthens those lungs (REFLECTION)
 Girl 3: oh and talking (REFLECTION)
 ST: yes talking especially when you have to talk long then you feel it here (REFLECTION)

26.15. The student teacher stands up and laughs with Girl 3 and Boy 1. Boy 2 has a comment and the student teacher bends down to the boy's level after he had asked the question and demonstrates playing a wind instrument. The student teacher is seemingly glad that the boy does not play sports but has another kind of hobby that strengthens the lungs. The student teacher looks surprised when the bell rings and stands up. The task ends smoothly and the pupils get up and leave the table which situate on the hallway and go back to their own classroom.

Girl 3: blaa blaa blaa
 Boy 1: blaa blaa blaa
 ST: not maybe that kind of talking
 Boy 2: but I doubt that playing piano strengthens much (REFLECTION)
 ST: no but do you know that playing wind instruments does (REFLECTION)
 Boy 2: yes I play the trombone
 H: well now you see
 Boy 2: ty-ty-ty-ty-ty (.) besides the piano
 ST: is that already our clock (.) is there any other thing (.) write lack of breathe clearly there (.) and also moving (.) sports (.) however you want to write it (.) (CONTROL)
 Girl 3: is this alright (MONITORING)
 ST: yes (.) bye then (.) let's switch (.) take these with you (.) leave the blue pencils here (.) then go back to class

Negative learning incident at the beginning of the lesson: a transitional situation.

Time and macro-level behaviours

10.00. The student teacher (female) is getting to the point where she tries to end the task, but pupils are still eagerly engaged in it. The student teacher stands still and does not react to Boy 3's comment, just laughs a bit. The actively commenting Boy 7 immediately responds to Boy 3's question and shakes his head. The student teacher does not pay much attention to this question (the occipital bone's straight translation from the Finnish language is "backrage"). The pupils in the class are still quite calm and focused on the task.

Boy 3: the skull
 ST: well the skull (.) it is a bone again (REFLECTION)
 Boy 3: oh
 ST: yes (.) Boy 7
 Boy 7: why do you think that the name "backrage" is like it is (.) why the name "backrage" is something like "backrage" (.) like some rage there in the back of the head (REFLECTION)
 ST: hmm
 Some of the pupils: why not "backjoy" (REFLECTION)
 ST: that would be an interesting name
 ST: what is here then (APPLYING A STRATEGY)
 BOY 7: "back peace"

10.20. The student teacher still continues with the task and tries to get pupils' attention back to it by putting her hand on her stomach and asking what it is. Boy 7 is still thinking about the previous question he had concerning occipital bone. Girl 2 answers the question. Pupils are starting to chat and laugh with each other, some noise comes into the classroom. Suddenly Boy 7 comments about the big picture hanging on the wall. The student-teacher stands still and doesn't react to Boy 7's comment. Boy 1 responds instead. Some of the pupils make a comment about Girl 2. The noise is in the classroom increases.

ST: Girl 2
 Girl 2: I don't have it but the chest is here (MONITORING)
 ST: here is the chest and what is here (.) just say it (CONTROL)
 Girl 2: the tummy
 Boy 7: now I know what we are going to do with that (MONITORING)
 ST: mm (.) Boy 1
 Boy 1: yeah I know too what we are going to study (MONITORING)
 Some of the pupils: when you Girl 2 said chest it is really a rib-cage (MONITORING, CONTROL)
 Girl 2: I said so (CONTROL)

10.50. The student teacher takes few steps to the centre of the classroom, looking a bit tens, and tries to move on but the pupils are still engaged in the task. She gives Girl 5 a turn, who lists many other body parts, which further triggers more thinking and comments from other pupils. Boy 7 is wondering out loud again, but the student teacher doesn't respond to any of the pupils' comments.

ST: then next we could start to learn these in more detail or do you still have many of these body parts in mind (.) say Girl 5 (CONTROL)
 Girl 5: eyebrows (.) eyes (.) external ear (.) the inner ear (.) hammer
 Some of the pupils: middle ear
 Boy 7: a hammer (.) why do we have a hammer (.) do we hit our heads on the table or what (REFLECTION)
 The same pupil who said "middle ear": we have a "hammer" here inside of our ears (REFLECTION)

11.05. It is getting more restless in the classroom and Girl 5 keeps listing the parts of the ears. Boy 1 asks a question to which the student teacher answers. Another student teacher (female) walks to the front of the class, because it should be her turn soon. The first student teacher looks at this one who coming towards her and then touches her sides. The other student teacher takes control of the situation while the original one stands still at the front. Both touch their hips when the hips are mentioned. The student teachers glance and nod at each other, then they look back at the pupils. The other student-teacher gives one more turn to Girl 5 who has not understand the definition of body part. The student teachers does not

Girl 5: and "stirrup" and "anvil"
 Boy 1: when are we going to see that closely (MONITORING)
 ST: at the end of the lesson (.) let's start practising (CONTROL)
 Other ST: was there still something
 Some of the pupils: the sides
 ST: the sides are good to mention (.) that wasn't said (.) we have two sides (REFLECTION)
 Some of the pupils: and back
 ST: yes we have

(continued on next page)

(continued)

clarify the definition for the pupils. After this the other student teacher moves to her own part of the lesson and the incident ends.

Some of the pupils: back has been already said (CONTROL)
 Other ST: well now (.) does Girl 5 still have something in mind
 Girl 5: hips
 Other ST: you all know so much
 Girl 5: and what it is (.) shoulder blade
 OTHER ST: yes but it is bone again (REFLECTION)
 ST: it is bone yes (REFLECTION)
 Girl 5: but a part of the body (REFLECTION)

Appendix B. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.tate.2019.06.003>.

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