Lesson study in Dutch initial teacher education explored: its potential and pitfalls

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Abstract

Purpose – This paper explores the potential and pitfalls of Lesson Study (LS) in Dutch initial teacher education (ITE). This context is examined through data drawn from student-teachers and teacher educators participating in LS.

Design/methodology/approach – Three case studies of three teacher education institutes in the Netherlands are presented, focusing on student-teachers' learning in two cases and teacher educators' learning in the third case.

Findings – The case studies show that LS in the context of Dutch ITE has high potential. All cases yield clear benefits for working collaboratively as a result of participating in a LS. Student-teachers appreciate the explicit focus in LS on how students learn and teacher educators stress how LS may strengthen their role as "teachers of teachers." Time, planning arrangements, commitment and a LS facilitator are highlighted as essential conditions for LS application in ITE.

Research limitations/implications – The three cases address a specific ITE context focusing on different target groups (student-teachers and teacher educators in applied and/or research universities). Consequently, results are explorative regarding Dutch ITE.

Practical implications – The potential of LS in Dutch ITE is recognized and stressed; this study may act as a catalyst for further and wider application of LS in this context, taking into account possible pitfalls and conditions.

Originality/value – This is one of the first studies exploring the potential of LS in Dutch ITE using both student-teachers' and teacher educators' perspectives.

Keywords Lesson study, Initial teacher education, Professional learning

Paper type Case study

1. Introduction

Lesson Study (LS) is claimed to be the world's fastest growing teacher professional development approach (Dudley, 2015). Its popularity can be explained in terms of the

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practical, hands-on orientation, as it is situated in teachers' daily classroom practice (Dudley, 2013; Verhoef *et al.*, 2014). Moreover, LS entails several critical features of effective professional development (Lewis and Perry, 2014) such as being active and collaborative, subject-focused, coherent with teachers' knowledge and beliefs, and the cyclical way of working spanning a longer period of time (Desimone, 2009). As such, LS has the potential to enable teachers to bridge the gap between theory and practice and to counteract their still often-perceived isolated profession (Cajkler *et al.*, 2015).

As researchers around the globe have increasingly started to examine LS in different educational contexts and settings aiming to determine its successful mechanisms and effects on teacher and student learning (Dudley *et al.*, 2019), the knowledge base around LS is growing rapidly. However, although the impact of participating in LS on teachers' knowledge, skills and attitudes (Vermunt *et al.*, 2019), the school context (Schipper *et al.*, 2020), and student learning becomes more evident (Lewis and Perry, 2017), LS in initial teacher education (ITE) has received relatively little attention in research, despite a recent peak of publications (Cajkler and Wood, 2020; Larssen *et al.*, 2018). Moreover, LS in Dutch ITE has not been thoroughly examined yet, and we argue that this article is one of the first studies that explores this context. For this reason, we include three different Dutch ITE contexts to determine whether differences and similarities between these varying contexts arise. The first two cases draw on data from student-teachers, but differ in the kind of teacher training program these students are enrolled in (university of applied sciences versus research university), and the third case uses data from teacher educators participating in LS. These different perspectives enable us to get a "first picture" of LS in the Dutch ITE context. From here, future studies could address each context on its own and allow for deeper examination of the specific contexts.

The overarching research question is to what extent can LS be applied in Dutch ITE in order to promote the professional learning of student-teachers and teacher educators. In order to answer this question, we focused on the following sub-questions:

(1) To what extent were the cases successful in applying LS in ITE in terms of (self-) reported benefits for participants' learning?

(2) What adaptations are needed in the LS model in order to use LS in the three different case contexts of ITE?

(3) Which factors constrain the application of LS in ITE?

2. Theoretical background and aim of the study

Previous studies indicated that LS in ITE can reduce the gap between theory and practice through collaboratively exploring the "pedagogic black-box," enriching the experience and learning of both student-teachers and teacher educators (Cajkler *et al.*, 2013, p. 537). Also, effects on student-teachers' pedagogical content knowledge (Leavy and Hourigan, 2016) and teacher educators' professional learning (Cajkler *et al.*, 2013) have been reported. Despite the potential of LS in ITE becoming increasingly apparent in these and other studies (see literature review by Larssen *et al.*, 2018), much remains unclear about its mechanisms and learning processes of LS, particularly in this specific ITE context. This not only refers to actual mechanisms and learning processes of student-teachers and teacher educators, but also relates to applying LS in ITE, as was found in the review of Larssen *et al.* (2018): "In contrast to LS undertaken by in-service teachers, who may have the opportunity to spread the LS cycle over a number of weeks or even months, practicums undertaken by ITE student-teachers are much more constraint by time" (p. 5). In particular, the review highlights several constraints when it comes to completing a full LS cycle, the planning of a LS cycle when

student-teachers do not have the opportunity to teach in a real classroom setting and bridging the gap between universities and schools where student-teachers fulfill their internships. The authors argue that, due to the variety of adaptations and a lack of the theoretical and practical reasons of these adaptations, "there was no universally held understanding of, or explanation for, the process of observation, how it should be conducted, and who or what should be the principal focus of attention" (Larssen *et al.*, 2018, p. 8). As such, school conditions that foster or hinder LS application should also be taken into account when examining how LS participants learn (Schipper *et al.*, 2020). To structure these conditions, a distinction can be made between structural and cultural school conditions (Imants and Van Veen, 2010). Scheduling arrangements and time facilitation are examples of structural conditions, whereas participants' commitment and school leader support can be seen as cultural conditions.

In the context of ITE, a distinction can be made between LS for student-teachers (Bjuland and Mosvold, 2015; Leavy and Hourigan, 2016), LS for teacher educators (Lenski *et al.*, 2018) or a combination of the above in which teacher educators, (teachers) and student-teachers participate in the LS team (Cajkler *et al.*, 2013). Given this variety in terms of the various adaptations of LS in ITE, "there are significant organisational and logistical challenges and constraints to consider when incorporating lesson study in ITE" (Ni Shuilleabhain and Bjuland, 2019, p. 436). After comparative analysis of two distinct educational and cultural settings, Ni Shuilleabhain and Bjuland (2019) found three structural and essential factors for incorporating LS in ITE. These refer to (1) the role of the teacher educator, who acts as a LS facilitator and sometimes as a "knowledgeable other" (Takahashi, 2014), and who is also actively involved in the LS cycle itself, (2) student-teachers engaged in the LS cycle who bring about their own ideas and include "case pupils" (Dudley, 2013) in the LS cycle to gain insight into how students learn, and (3) conducting LS in conjunction with other subject pedagogic modules which could provide a coherent link between theory and practice.

Given this background, this study aims to explore the benefits and constraints of applying LS in Dutch ITE. LS in Dutch ITE is still in its infancy, though LS in the Netherlands is growing rapidly (De Vries *et al.* 2016; De Vries and Roorda, 2019; Schipper *et al.*, 2020; Wolthuis *et al.*, 2020). Little is known about the application of LS in this context and the learning of student-teachers and teacher educators participating in LS. In this paper, professional development is defined as the actual LS activities, whereas professional learning refers to the processes and outcomes of participating in these LS activities (Vermunt *et al.*, 2019).

3. Context case studies

The cases included in this study follow the Dutch LS model (De Vries *et al.*, 2016), which is based on the LS model by Stepanek *et al.* (2007) and the model developed by Dudley (2013). The core feature in the latter model, distinguishing it from other LS models, is the specific focus on "case pupils" who represent different groups of learners (e.g. attainments groupings) (Dudley, 2013). The Dutch LS model allows more room for selecting "case pupils" based on behavior or other criteria, depending on the research question participants of the LS cycle agree on. Lesson plans, observations and post-lesson discussions are organized around these "case pupils." Subsequently, "case pupils" are briefly interviewed after each research lesson in order to gain insight on how they experienced the research lesson, what they learned (from their own perspective) and whether they have suggestions to improve the enacted lesson.

The three case studies took place in three universities situated in three different parts of the Netherlands where two clusters of teacher education programs can be distinguished. One cluster involved teacher education programs at master's level (MSc), preparing student-teachers to teach all tracks of secondary (age 12–18) and vocational education (age 15 and older); the other cluster involved teacher education programs at bachelor's level (BEd) in universities of applied sciences preparing student-teachers to teach in lower secondary and

(preparatory) vocational education (OECD, 2016). Both clusters integrate a practical orientation (learning by doing in the classroom context) and a research orientation (using relevant educational and learning theories and aiming to develop an inquiry mindset) embedded in school-university partnerships (OECD, 2016). The focus in the master's programs, however, is more research-oriented (hence also referred to as "research universities"), whereas the focus in the bachelor's programs is more practical-oriented (OECD, 2016).

The first case took place in a university of applied sciences and included two cohorts of student-teachers (2016–2017 and 2017–2018) participating in 11 LS teams of biology student-teachers who were in their second year of their four-year bachelor's program. The LS was part of a six European Credits (ECTS) course of which LS covered 50% of this course. LS was used as a means to bridge the gap between theory and practice, enabling students to make connections between theoretical concepts and enactment in practice. As such, student-teachers were specifically asked to use educational theories about pedagogical content knowledge to justify their decisions when designing and refining their plans for the research lesson.

The second case, situated in a research university (OECD, 2016), also included student-teachers, but these were enrolled in a two-year master's teacher education program following a content-specific bachelor's in either biology, computer science or physics. The aim of this case was to explore whether LS could be used as a way of involving students in lesson design and purposeful observation.

In addition to these two cases focusing on student-teachers participating in LS, the third case is particularly focused on teacher educators' learning as a result of participating in LS. Two LS teams of teacher educators from a university of applied sciences initiated a LS cycle. The LS teams of teacher educators were organized around the subject areas of educational sciences (which cover topics such as learning theories, classroom management, differentiated instruction) and English language and literature. These LS teams first wished to experience participating in LS prior to applying LS in their teacher education curricula. This case not only focused on teacher educators' professional learning as a result of LS but also on the conditions related to LS application within teacher education.

An overview of the samples, data sources and methodology of each case is presented in Table 1. In the following section, we elaborate on the three separate cases paying attention to the aims, context and the findings in terms of student-teachers' or teacher educators' learning and the LS application in each case study.

4. Case 1: Biology student-teachers in a university of applied sciences

4.1 Aim and context

In this case study, student-teachers' learning was examined by asking them about their experiences with LS, the choices they made when designing and revising their lessons and to what extent they used pedagogical (content) knowledge to legitimate their lesson design choices. Fourteen student-teachers from cohort 2016-2017 (February-April) and 20 student-teachers from cohort 2017-2018 (February-April) ($n = 34$) participated in 11 LS teams, each consisting of three to four biology student-teachers.

The course consisted of seven meetings of 150 min each, of which the second until the sixth meetings represented the LS cycle. The first meeting was to explain the course goals, set expectations and explain the course assignment and LS. In the last meeting, evaluation reports were written. The teacher educator served as the facilitator and was responsible for explaining each specific LS phase, explicating pedagogical knowledge and pedagogical content knowledge, such as the concept-context approach in biology (Ottevanger *et al.*, 2016), and to allocate one hour per meeting for designing the lesson and observation form. The student-teachers could choose the topic of their research lesson. During the fourth meeting, a subject matter specialist in biology was present to help the student-teachers with their lesson design. Student-teachers' conversations within meetings were audio-recorded with student-

Case	Sample	Data sources	Analysis
1	34 Biology student-teachers divided into 11 LS teams	(1) Audio-recorded conversations during LS meetings (2) Written personal reflection about decision-making during final LS meeting (3) Digital survey during final LS meeting answering three open questions	All data sources were analyzed by coding the data in terms of mentioned benefits and problems participants encountered. Exemplary quotes from the survey were used to reinforce claims that were made
2	16 student-teachers divided into four LS teams	(1) Student-teachers' written reports (logs) and meeting notes (2) LS meetings: Lesson observations, lesson plans, teaching material (3) Post-lesson interviews	All data sources were analyzed by coding the data in terms of mentioned benefits and problems participants encountered. Exemplary quotes from the post-lesson interviews were used to reinforce claims that were made
3	Eight teacher educators divided into two LS teams	(1) Learner reports filled in after each LS meeting (2) Written evaluative questions at the end of LS cycle (3) Focus group interviews (semi-structured)	Participants' learning was monitored through filling in learning reports during their LS participation. This produced valuable information to see how the LS process was experienced by participants. The written evaluative questions at the end of the LS cycle were analyzed independently by two researchers and were subsequently compared. Based on these reports, a semi-structured group interview protocol was developed. Interviews were audio-recorded, and illustrative quotes were selected to reinforce claims in the results section

Table 1.
Overview of case methodology

teachers' active informed consent. One student-teacher enacted the research lesson in a class of a school where the student-teacher was carrying out an internship, and the student-teacher's peers observed the "case pupils." In the seventh and last meeting, student-teachers wrote a reflection about their pedagogical and didactical decision-making within the LS cycle and substantiated this with theory. During the last meeting, a digital survey was filled in by the student-teachers with three open questions: (1) What did you learn from participating in LS? (2) From which LS phase did you learn the most? (3) How does participating in LS make you a better teacher? All answers were categorized on similarities and differences (Patton, 2015).

4.2 Results

With regard to the first question, there were mainly two types of answers. On the one hand, student-teachers reported to have benefited most from collaborative lesson design; they specifically valued sharing knowledge and practices as well as listening to each other's points of view:

> I've learned most from designing the lesson together. I got to hear different views and to experiment with things I would normally not do in a lesson.
>
> [Male, LS team 1, cohort 2017/2018]

On the other hand, student-teachers valued lesson revision, especially giving and receiving feedback in the post-lesson discussion:

> I've learned most from the feedback of my peers, because they give me new perspectives.
>
> [Male, LS team 4, cohort 2016/2017]

Furthermore, some student-teachers mentioned that they reflected on the choices made in designing the lesson plan. However, although student-teachers reported that they learned from these reflections because this gave them new insights, they do not mention how this reflection took place. Some student-teachers also reported valuing detailed lesson observation. However, learning how to use pedagogical content knowledge to substantiate decisions in lesson design was not reported.

Regarding the second question relating to the specific LS phase, student-teachers reported to have learned most from collaborative lesson design:

> I've learned that collaboration between colleagues should be encouraged more in education. Because we worked together as a group from the start, it becomes normal to give feedback on each other's lessons and lesson designs.
>
> [Male, LS team 1, cohort 2016/2017]

The student-teachers also appreciated the insights acquired from designing the lesson:

> I've learned that there are many ways to achieve a goal and one should carefully consider which resources can be used to reach each goal.
>
> [Male, LS team 2, cohort 2016/2017]

Another student-teacher found that participating in LS positively influenced their professional learning as a team:

> It prepares you for working in a team and it helps to let you see that your view isn't the only way to look at it.
>
> [Male, LS team 5, cohort 2016/2017]

Two student-teachers of the same LS team mentioned the focus on student learning as a benefit from participating in LS on their professional learning:

> Different teachers have different views that are suited for different kinds of students. When I get to know more ways of teaching, I can adjust more to the learning of different students.
>
> [Female 1, LS team 2, cohort 2016/2017].

Despite these positive notions, three student-teachers were not as positive about the collaboration. One of these student-teachers mentioned:

> I've learned that when working together in a group of three, there is a big chance one will get left behind.
>
> [Female, LS team 2, cohort 2016/2017]

To summarize, student-teachers reported benefits such as expanding their teaching repertoire by collaborating, learning about each other's views and focusing on students' learning. Decisions in lesson designs were mainly based on their own prior knowledge and ideas. Students did not mention increasing their pedagogical (content) knowledge as a benefit of LS. Though the student-teachers mentioned they learned from student observation, their notes in their observation forms mostly focused on teachers' behavior, and very general notes were found solely in terms of observations of students' learning. Also, the revision of the lessons was barely done based on observations of students' learning. This course was designed to apply LS as a means to bridge the gap between theory and practice, yet the

answers of the student-teachers contained no references to pedagogical (content) knowledge as a benefit of LS. We can conclude that conducting a LS cycle with fidelity, using pedagogical content knowledge in lesson design to inform practice with evidence, is challenging for second-year bachelor's student-teachers.

5. Case 2: student-teachers in an academic research university

5.1 Aim and context

In this case study, the use of LS as a means to involve student-teachers in lesson design and more purposefully observation was explored. By engaging student-teachers in LS, the teacher educators' assumption was that LS could function as a leverage to develop an inquiry-based stance with student-teachers (Lewis, 2011) and that they would develop a more flexible outlook to adapt lessons to the instructional needs of their students. Another motive was to prepare student-teachers for engaging in in-service continuous professional development programs once they would leave the teacher education program. As part of a two-year science teacher education master program, an elective course of five ECTS was designed around delivering one full LS cycle. Participants were 16 student-teachers divided into four LS teams according to their teaching subject: biology, computer science, physics (twice).

In the LS cycle, participants used structured forms for stating goals and research questions, planning the lessons and observing three specific case pupils, following De Vries *et al.* (2016). The course consisted of four plenary sessions, in which all LS teams were present, and six team meetings in which the actual LS cycle was performed, which was supervised by an experienced teacher educator. Each team worked together with a subject matter teacher, teaching in a partner school affiliated with the university's science teacher education department. This teacher offered both the opportunity to perform the research lesson in his or her classes, as well as the opportunity to observe the classes prior to enacting the research lessons so that student-teachers could prepare for anticipating students' responses in the lesson plan. The LS teams arranged two meetings with the subject matter teacher to firm up lesson preparation and selection of case students. As part of the course assessment, student-teachers wrote a team report on the LS cycle, and each individual student-teacher also wrote a separate reflection report on his or her learning experiences.

Data consisted of student-teachers' logs and meeting notes, lesson observations, post-lesson interviews, the produced lesson plans and teaching materials, as well as their written reports. Active consent was obtained from the student-teachers to use these data. Data were analyzed by coding them in terms of mentioned benefits and problems they encountered.

5.2 Results

We report on the LS cycle of one team collaborating with a physics teacher teaching at an international secondary school. A science teacher educator, who also acted as the knowledgeable other, facilitated the team. The topic of the lesson was the construction and interpretation of graphs within elementary mechanics. An issue that became apparent at the start of the LS cycle was the need to direct student-teachers' focus to subject matter theory in order to slow down immediate and practical decision-making in designing the lesson plan. The student-teachers were inclined to have their own physics lessons as their main reference point. During the LS cycle, student-teachers' focus changed: the supervisor emphasized the need to view the LS plan as a research activity and to use pedagogical theory. The change in focus can be illustrated by this written meeting note from a student-teacher that appeared after the third LS session:

> We discussed on what we really want to teach them. From this question arises a need to better pose the research question and hypothesis.
>
> [Student-teacher's written report].

In the meeting notes, student-teachers also referred to theories on learning difficulties related to the topic that are known from literature (e.g. mixing up graphs for speed and position). After observing two regular lessons of the class involved, student-teachers selected case pupils and formulated concrete expectations for them. In their team report, these expectations are formulated as expected *learning outcomes* as illustrated below:

> Student can connect a v(t) graph from s(t) graph for piecewise uniform motion.
>
> [Student-teacher's written report].

On the observation form, behavioral expectations are given:

> Student does not have much issue with determining the average velocity. Student actively participates in group activities, expressing their ideas loudly.
>
> [Student-teacher's worksheet].

Student-teachers' reports do not give any indication of their awareness of the differences between the two kinds of expectations, making it impossible to check their expectations with their observations. After enactment of the research lesson, the lesson appeared to be not challenging enough as the secondary education students expressed boredom (as written in observation notes). In a redesigned lesson, more active student participation was planned. Unfortunately, the subsequent research lesson could not take place as there was not another class available where this research lesson could be conducted (in terms of education track, age group and topic of the lesson). In the meeting notes, student-teachers' reflection reports and the LS team report, student-teachers mentioned the relation between theory on learning about graphs and lesson design. The student-teachers mentioned the type of theories that were used in the design and discussed their own professional learning in the reflection reports. The theoretical focus was on student-teachers' pedagogical content knowledge, such as common misconceptions in the interpretation of graphs. Another insight reported by student-teachers is their development toward an inquiry stance with regard to the research lesson. For instance, one group member reported:

> At first, I was unsure about the importance of the research question and the learning hypothesis, and now I am, at least regarding the latter, convinced it brings a lot to the lesson (re)design.
>
> [Individual reflection report].

Another student-teacher reported:

> This course has given me a researcher's perspective on education, and it proved to be as influential and significant for my personal development, [. . .] I am now also able to envision myself as an education researcher, instead of solely as a teacher.
>
> [Individual reflection report].

The teacher educator noticed that team commitment and collaborative effort evolved during the LS cycle, as the student-teachers expressed that each of them felt efficacious to teach the research lesson which arose from the fact that only in the last meeting prior to the research lesson, a team decision was made regarding who would teach the actual lesson. Both teacher educator and student-teachers evaluated the LS-cycle as a positive endeavor. One student-teacher stated in her reflection report:

> We have profited a lot from the lesson studies, yet I think that for beginning teachers, a combination of a LS and old-school class observations would be a perfect fit.
>
> [Individual reflection report].

6. Case 3: teacher educators in a university of applied sciences

6.1 Aim and context

In this case study we were interested to find out whether participating in LS contributes to teacher educators' professional learning and which conditions are relevant for successful application of LS in a teacher education program of a Dutch university of applied sciences. Eight teacher educators participated, divided into two LS teams. One LS team of English language and literature teacher educators ($n = 3$) focused on motivating student-teachers to read English literature. The other LS team of educational sciences teacher educators ($n = 5$) focused on supporting pre-service teachers' role and identity development from being a higher education student to becoming a teacher.

The English language and literature team conducted one LS cycle, whereas the educational sciences team was followed over the course of two LS cycles. A LS cycle consisted of four meetings and two research lessons covering up to half the academic year. Both teams were facilitated by an in-house experienced LS facilitator and researcher.

After each LS meeting, participants were asked to describe their (learning) experiences in learner reports. At the end of the LS cycle, the participants were invited to reflect on several additional written evaluative questions focusing on (1) whether LS contributed to their professional learning, (2) what elements of LS were main contributors to their professional learning (3) which conditions are needed for successful application of LS in their professional context and (4) whether they felt there were any barriers or missing elements in the LS process. The evaluative questions were analyzed independently by two researchers and were subsequently compared. To explore whether the reported professional learning occurred and to deepen our understanding about LS application, one year later, both groups of participants were invited for a one-hour focus group interview. Based on the evaluative questions in the learner reports, a semi-structured interview protocol was developed focusing on what they learned as a result of participating in LS, to what extent LS could be seen as a suitable professional development approach in ITE and if they still applied LS in their professional practice. In addition, several questions were added related to how LS could best be applied within the ITE context and under which conditions. Below, we report on the group interviews only.

6.2 Results

In terms of teacher educators' professional learning, participants refer to LS as a means to working collaboratively with colleagues and having professional conversations about collective knowledge and pedagogical practices in their context. They argue that participating in LS counteracts a culture of isolation, which is illustrated by one teacher educator:

> Well in particular, that we know what each of us is doing in their lectures, that I found powerful. And that you look at the students like when does a student-teacher drop out, where and when does a student-teacher focus on something and when doesn't he. That the learning of the student is really central.
>
> [Educational Sciences teacher educator, male]

Participating in LS further supports them to thoroughly investigate their own pedagogical practices, for example, lesson design, opportunities to share and reflect on new and existing pedagogies and analyzing and evaluating student-teachers' responses to their teaching activities and instruction. In their opinion, this contributes to the quality of their curriculum as well as to their teaching practice. In addition, teacher educators reported that LS gave them the opportunity to read relevant research literature that supports them in the – often

neglected – process of lesson design. By discussing literature and experiences, they created a shared language and view on teacher education in terms of the education of teachers and its pedagogy. Another aspect of particular interest for teacher educators is that participants of both teams not only stressed the importance of LS for their own development, but as "teachers of teachers" they also considered participating in LS as a means to show the importance of continuous and collaborative professional learning to their student-teachers.

> In addition, professionally [. . .] you're not just teaching, but you're teaching about teaching, so explicating of what we're doing. And the question is to what extent do we already do this and what can you learn in that regard from each other.
>
> [Educational Sciences teacher educator, male]

Specific LS elements contributing to teacher educators' reported professional learning were related to working collaboratively in each step of the LS cycle, the detailed lesson planning stage, as well as having a professional and thorough evaluation of the research lesson(s) using insights from the post-lesson interviews that were held with student-teachers immediately after the research lesson. The feedback and views of student-teachers were highly valued and allowed teacher educators to refine their research lesson. Participants also realized that participating in LS is not only good for them, but should also be part of student-teachers' development. One participant even argued that:

> From the start I thought that this [LS] should actually be the final research assignment for student-teachers in teacher training programs.
>
> [English language and literature teacher educator, female].

In terms of successful LS application, the participants argued that time is needed as well as clear scheduling arrangements and managing logistics (structural conditions), whereas participants also cited the importance of having commitment and presence of all LS team members (cultural conditions). Being committed is emphasized a few times by participants, as illustrated below:

> But seriously, we are all ridiculously busy, that applies to everybody, and commitment is what you need then. The feeling of making time for and putting effort in it.
>
> [English language and literature teacher educator, male].

Furthermore, participants argued that, especially in the context of ITE, a bottom-up initiation of LS would be preferred over a top-down implementation as teacher educators should be well able to address their professional learning needs and work in a professional culture where collaborative research activities already have a prominent place.

7. General conclusion

This paper aimed to explore the potential and constraints of LS when applying it in Dutch ITE. We decided to include three different teacher education departments where LS was applied to generate a rich picture in terms of how participating in LS contributes to student-teachers' and teacher educators' learning. In this section, the main conclusions of each case study will be presented first. Following this, we aggregate these findings from the different case studies in order to answer the research questions.

The first case study focused on student-teachers in the beginning phase of their biology teacher education program (bachelor's level) who participated in LS as part of a six ECTS course. Following their participation, student-teachers answered a survey

focusing on what they learned from LS participation, from which LS phase in particular and how LS enabled them to become a better teacher. Student-teachers in this case study highlighted that LS participation supported them to elicit new ideas about teaching and learning, and to discuss these ideas with their peers and facilitator. Working collaboratively enabled this and was highly valued by the student-teachers. Revision of the research lesson and the observations in real time enabled student-teachers to analyze and evaluate anticipated and actual student responses to the instructions and activities during the research lesson. However, although not explicitly asked, student-teachers did not make any reference to the use of pedagogical content knowledge and how LS can bridge the gap between theory and practice. Also, for student-teachers in the beginning of their teacher career and not familiar with observing student learning, it may be wise to support student-teachers in observing research lessons prior to their participation in LS (Bjuland and Mosvold, 2015).

The second case study involved student-teachers in science teacher education who enrolled in a five ECTS elective course in which LS was used to involve them in purposeful lesson design and student observation. The research lesson's topic was constructing and interpreting graphs within elementary mechanics. The results show that student-teachers made a transition from intuitively assembling a lesson plan based on their prior experiences with their own taught lessons, to more purposeful attention to and detail in formulating research questions and hypotheses, and in anticipating students' responses on the planned instructions and teaching activities. The different stages in the LS cycle supported them to go thoroughly through each step and why it is essential to start with a clear focus before moving on to careful planning of the research lesson (and teaching in general). The redesigning phase of LS gave student-teachers the opportunity to reflect on their experiences with the first research lesson where they concluded that the lesson was not challenging and motivating enough for the students. Awareness of the importance of formulating research questions and hypotheses convinced student-teachers of the potential of LS. Moreover, a "researcher perspective," which is part of LS (Bjuland and Mosvold, 2015), allows student-teachers to increasingly learn about teaching and learning, and how they could transfer what they learned in LS to their own classroom practice. The lesson planning phase and teaching the research lesson were experienced as a collaborative effort, which was stressed as well. This aligns with research by Cajkler *et al.* (2013).

Whereas the first two case studies were concerned with student-teachers' learning, the third case study examined whether participating in LS contributes to teacher educators' professional learning and which conditions for successful LS application teacher educators distinguished. Clear examples were reported of how participating in LS could support high-quality collaboration through examining and discussing theory and experiences from practice. This led to the development of shared language and views. Moreover, they argued that LS could counteract a culture of isolation (Cajkler *et al.*, 2015), and they highlighted the potential of participating in LS in their role as "teachers of teachers" (cf. Loughran, 2016).

In terms of conditions, teacher educators argued that sufficient time and scheduling arrangements (structural conditions), and commitment and presence of each teacher educator (cultural conditions), are essential in order to successfully apply LS to ITE. Arguably different from other contexts is that teacher educators in this case study claimed that a bottom-up approach (i.e. teacher educators who initiate LS in their own context) would be preferred within such a setting.

To summarize, based on these explorative case studies, we conclude that LS within Dutch ITE has high potential for student-teachers as well as for teacher educators. Although the focus and outcomes differ to some extent, all cases show that participating in LS for both student-teachers and teacher educators results in benefits for working collaboratively. In terms of the first research question, it becomes clear that participating in LS enables

participants (student-teachers and teacher educators) to gain more awareness of students' (instructional) needs. It also seems to support their professional learning in terms of their pedagogical content knowledge, teaching behavior and inquiry stance. In some instances, especially in the second and third cases, clear notions of professional learning were elicited.

Regarding the second research question – what adaptations are needed in the LS model in order to use LS in the three different case studies – the answer is less unambiguous. Although participants were asked how the LS cycle was executed, it remains unclear whether the LS model used in other Dutch educational contexts (De Vries *et al.*, 2016, Schipper *et al.*, 2017) was adapted to the context of Dutch ITE. A difference, however, was found in the LS cycle in the second case which included an extra session in which LS teams exchanged their (learning) experiences. Participants did not report how they changed (elements of) the LS cycle and how this contributed to their learning. In general, LS is a flexible approach and often subject to cultural and organizational contexts as well as the needs of the LS team members (Lim-Ratnam *et al.*, 2019). This may make it harder to distinguish clear adaptations when teams address all stages of the LS cycle. It became clear, however, that participants appreciated the different stages in the LS cycle, with some stages highlighted in particular, and the use of "case pupils" was highly valued in the different case studies as well.

Regarding the constraining factors of applying LS in ITE (i.e. the last research question), the need for sufficient time, clear planning arrangements and logistics, commitment and presence of LS participants and a LS facilitator, who not only guides the LS team but also encourages team members to bridge the gap between theory and practice, were particularly stressed by participants in the third case. If these conditions are not sufficiently taken into account, this would likely have negative consequences (Schipper *et al.*, 2017). The teacher educators in the third case study also highlighted that a top-down implementation of LS by managers would undoubtedly fail in their context. A constraining factor more implicitly addressed by student-teachers in the first and second cases possibly relates to a lack of teaching and observation experience of student-teachers. The LS facilitator could play an essential role in this regard by highlighting important aspects making student learning visible. It can also be argued, as was in the first case study, that student-teachers should need observation training prior to their participation in LS, as student-teachers seem to struggle with student observation (Bjuland and Mosvold, 2015).

9. Discussion

The results arising from the three case studies add to the knowledge base of applying LS in the context of (Dutch) ITE and corroborate findings in earlier studies. The potential of LS in bridging the gap between theory and practice was also highlighted by Cajkler and colleagues who conclude that "LS has the potential to bridge gaps between theory and practice and between trainee and experienced teachers by offering a structured opportunity for collaborative learning that explores pedagogy in greater depth than a "parallel" approach to trainee support" (Cajkler *et al.*, 2013, p. 552). The conditions that were mentioned as essential conditions that could either constrain or facilitate the LS application, such as time and scheduling arrangements, also align with earlier findings in various international contexts (Schipper *et al.*, 2017; Cajkler and Wood, 2020; Larssen *et al.*, 2018).

Before laying out potential areas of future research, it is important to note that this study relies solely on self-report measures. Although self-report instruments could yield rich information, participants may not always be aware of their professional growth, that is tacit knowledge (Eraut, 2000), and this may therefore bias the results. Furthermore, participants may not always be aware of the conditions necessary to apply LS in their context. This is particularly the case for student-teachers who generally lack a rich base of experiences in different school contexts.

What remains unclear, and is not explicitly addressed in this study, is what the role of the LS facilitator in the context of ITE actually entails and whether this differs from other contexts. In the first two case studies, teacher educators with experience in coaching LS teams in ITE were the facilitators of the LS teams. However, given the fact that student-teachers are in the process of becoming a teacher and do not possess the same pedagogical content knowledge and experience as in-service teachers, one might argue that the work of LS facilitators in ITE also entails other aspects such as modeling, training student-teachers in observing classroom behavior and teaching student-teachers to formulate suitable research questions and hypotheses. This is particularly relevant as student-teachers may have difficulties with formulating a research question and observing student learning (e.g. Bjuland and Mosvold, 2015). Additionally, the role of a content expert in ITE, and access to a so-called "knowledgeable other" (Takahashi, 2014), are worthwhile to further explore. This knowledgeable other could further deepen student-teachers' (pedagogical) content knowledge, which is essential in their teacher education program and as such can help linking theory to practice. This is also highlighted by Ni Shuilleabhain and Bjuland (2019), who argue that the teacher educator can act as a LS facilitator and knowledgeable other at the same time, which could be a structural and essential factor for incorporating LS in ITE. Another essential factor they mentioned is conducting LS in conjunction with other subject pedagogic modules as part of their teacher education program. These factors would be highly relevant to further explore.

Another aspect to further examine, following the third case study, is whether teacher educators should first experience participating in LS themselves prior to implementing LS in their curricula for student-teachers. The latter case study showed that the English language and literature teacher educators started this process for this exact reason: to experience LS first before using it in (one of) their courses.

A third aspect to explore relates to student-teachers' learning process and the development stage in their ITE program. When should student-teachers ideally start their LS endeavors, and what kind of knowledge and experience (e.g. pedagogical content knowledge and observation experience) do they need before they start? In this regard, Bjuland and Mosvold (2015) argue that careful attention should be paid to approaching the research lesson as researchers focusing on clear research questions, and that observations should be planned and conducted with a specific focus on student learning. Additionally, as the complexity of observation in LS for student-teachers is evident, the importance of preparing student-teachers to observe is repeatedly stressed (Bjuland and Mosvold, 2015; Larssen *et al.*, 2018).

A final aspect refers to involving all relevant "stakeholders" responsible for educating student-teachers in the LS process. This implies not only to teacher educators and student-teachers, but also to school-based mentors to be clear about the purpose of LS and to be involved in the LS cycle (Larssen *et al.*, 2018). As such, this could ultimately result in better-prepared teachers who are used to practice-based collaborative and continuous forms of professional development that could elevate their ongoing professional learning. This may "be the beginning of a transformation in the school culture" (Baldry and Foster, 2020, p. 158).

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