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A survey research on Finnish teacher educators' research-teaching integration and its relationship with their approaches to teaching

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ABSTRACT

The study aims to clarify how Finnish teacher educators integrate research and teaching to support their approaches to teaching. Research questions cover teacher educators' forms of research-teaching integration, approaches to teaching, and the relationship between them. With a survey methodology, the study obtained 101 responses with a questionnaire. Six forms of research-teaching integration were identified with a qualitative content analysis. Integrating research with teaching content was mentioned most often, whereas integrating research with teaching methods and applying inquiry-oriented methods in teaching were reported less. Three kinds of approaches to teaching were found by cluster analysis. The participants with different approaches differed in their ways of research-teaching integration. However, the differences were not statistically significant in Chi-square tests. The study contributes to the international research on teacher educators and the variety in research-teaching integration in teacher education. Future research could further explore the individual and contextual factors influencing their research-teaching integration.

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Research-teaching nexus; integration of research and teaching; approaches to teaching; teacher educators; Finnish teacher education

Introduction

Over the last few years, research conducted on and by teacher educators has drawn academics' attention internationally. Important questions like how teacher educators conduct their work as researchers and how their research is related to their teaching in teacher education have been raised (Geerdink et al. 2016; Gunn et al. 2016; MacPhail and O'Sullivan 2019; MacPhail et al. 2019). The research could improve not only teacher educators' knowledge and practice, but also teacher education and the teaching profession in a broad sense (Cochran-Smith and Demers 2008). Moreover, engagement in research activities can promote teacher educators' research-based thinking in teaching (Kansanen 2003). Teachers' approaches to teaching, which are combinations of teaching intentions and strategies, influence how students approach learning (Trigwell, Prosser, and Waterhouse 1999). Teacher educators need to consider the heterogeneity of student teachers' learning and create optimal learning environments to support efficient learning

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(Flores 2016; Tubić and Hamiloğlu 2009). They respond to this challenge by investigating their own teaching to reflect on it and improve it (Kynäslahti et al. 2006). Through teacher educators' pedagogies, student teachers learn about how to teach (Lunenberg, Korthagen, and Swennen 2007). While being actively involved in research activities, teacher educators are also role models for student teachers about how to be a teacher-researcher (Yogev and Yogev 2006). However, besides the close and positive research-teaching nexus teacher educators experience, research and teaching can also be in conflict (Healey 2005a). The various strategies universities apply to position research in teacher education shape teacher educators' different perceptions and experiences of research-teaching nexus (Gunn et al. 2015; McNicholl and Blake 2013).

In a general sense, a teacher educator is someone who contributes in a formal way to support the learning of teachers and student teachers (European Commission 2013). This group of professionals includes teachers with myriad work tasks and experiences, and working in contexts from teacher education programmes in higher education to schools (European Commission 2013; Swennen, Jones, and Volman 2010). Lunenberg, Dengerink, and Korthagen (2014) identified teacher educators as a heterogeneous group with multiple professional roles, including teacher of teachers and researcher. There is a growing consensus among researchers worldwide that teacher educators play a key role in improving the quality of teacher education (European Commission 2013).

This study focuses on the university-based teacher educators, whose main tasks are teaching and supervising student teachers, and conducting research. To be more precise, the study narrows the target group down at a more specific level, concentrating on teacher educators¹ at universities in Finland. The authors of this empirical study include a junior researcher and senior researchers working in teacher education. Our aim is to investigate how Finnish teacher educators integrate research and teaching, and how research-teaching integration is related to teacher educators' approaches to teaching when educating student teachers.

Research-teaching nexus in university context and in teacher education

Research and teaching are related in complicated ways (Visser-Wijnveen et al. 2010). By analysing an educational development project involving four UK universities, Griffiths (2004) argued that the research-teaching nexus can be unidirectional or reciprocal. In a qualitative study, Robertson (2007) found that teachers' experiences of the research-teaching nexus vary from a weak relationship to an integrated one. The specific forms of research-teaching integration have been explored empirically in an interview study conducted by Visser-Wijnveen et al. (2010) at a Dutch university. The study found that teachers focus on the teaching content by lecturing on research results or general disciplinary research. Accordingly, students learn specific research results or general research methods and processes (Visser-Wijnveen et al. 2010). The forms of research-teaching integration could be specific, or they could be more diffuse, meaning that teachers enrich their teaching with a general orientation and way of thinking generated from their research experience (Griffiths 2004). Healey (2005b) explained in a literature review study that students' experiences in the research-teaching integration vary, depending on whether they are passive recipients of knowledge or more active participants in the research activities. Students' participation in research is regarded as an

important approach for them to develop their knowledge of the discipline and academic dispositions. Thus, teachers help students to conduct research by giving them research assignments as part of the courses (Visser-Wijnveen et al. 2010). Meanwhile, inquiry-based methods are used in teaching to encourage students' engagement in research (Visser-Wijnveen et al. 2012).

These studies provide the backdrop for one particular line of enquiry into teacher educators' research-teaching nexus and integration. Teacher educators work in the changing and diverse contexts worldwide, and how they perceive and engage in research and teaching vary according to the national higher education policy, institutional strategy and formal qualification requirements of teachers, and the expertise of the individuals (Gunn et al. 2015). In countries such as Ireland, Norway and Finland, research has a critical role in teacher education. It is a shared idea that teacher educators conduct research and develop an academic identity (MacPhail and O'Sullivan 2019; Smith 2011). Researchers argued that teacher educators' research and teaching are linked reciprocally (Borg and Alshumaimeri 2012; Cochran-Smith 2005; Flores 2018). Teacher educators as professional researchers have a range of skills in conducting research (Cochran-Smith et al. 2008). They carry out practitioner research to explore their own teaching practice (Kansanen 2014), and improve their teaching accordingly (Kynäslahti et al. 2006). Meanwhile, their teaching is the source providing them with the inspiration and first-hand data for research (Borg and Alshumaimeri 2012; Cochran-Smith 2005). Conducting research also improves teacher educators' competence, which they can integrate with teaching and supervision of student teachers (Flores 2018). As researchers, teacher educators teach student teachers about research (Geerdink et al. 2016; Smith 2011), and model the academic work of teachers for them (Yogev and Yogev 2006). Accordingly, teacher educators involve student teachers in research because it can offer them opportunities to test the different educational theories and prepare them for the future work as teachers with an inquiring orientation (Lunenberg 2010).

Ideally, research and teaching are in an enriching relationship. However, in reality, they could be independent of each other or even in conflict (Healey 2005a). Teacher educators may face frustrations if research becomes output-oriented, and the external pressure from the institutions requires them to focus only on research at the expense of teaching (cf. Coate, Barnett, and Williams 2001; Smith 2011). The time and energy teachers can devote to work are limited, and they may have a preference for either teaching or research (Hattie and Marsh 1996). Teacher educators experience role conflict when their perceptions of their roles are contradictory to what others emphasise and they cannot accomplish the multiple roles (Colbeck 1998; Smith 2011). The situation gets even worse when teacher educators face obstacles, such as lacking institutional support to engage in research work (Lunenberg 2010). Concerns have been raised about teacher educators working as researchers considering their capacity, working conditions and the tension created by their research productivity and other responsibilities (Gunn et al. 2016; Hill and Haigh 2012; McNicholl and Blake 2013). However, the contention is not whether teacher educators should be more active in research or teaching. Instead, the challenges teacher educators face are indicative of the needs to explore how to promote an enriching research-teaching nexus for them to fulfil their multiple roles.

Work efficacy can be achieved when teachers are involved in joint activities in which they can accomplish both their research and teaching goals (Colbeck 1998). Teachers'

endeavour to integrate research and teaching could be encouraged when their research and teaching are in a close and beneficial relationship (Robertson 2007). Therefore, it is vital to know how teacher educators view their teacher/researcher role and the relationship between their research and teaching (European Commission 2013). Furthermore, a study involving 152 university teachers in China showed that even if teachers believe in the important role research plays in teaching, they do not necessarily know how to integrate research with teaching in practice (Hu et al. 2019). Thus, exploring how teacher educators integrate research with teaching is necessary and may provide new evidence for universities to develop corresponding strategies to enhance teacher educators' research-teaching relationship (Brew 2006).

Approaches to teaching at university and among teacher educators

Teachers' perceptions of the research-teaching nexus are related to their approaches to teaching (Hu et al. 2014). Approaches to teaching comprise two components: a strategy that teachers adopt while teaching, and an intention underlining that strategy (Postareff and Lindblom-Ylänne 2008; Trigwell, Prosser, and Taylor 1994). Trigwell, Prosser, and Taylor (1994) interviewed 24 first-year university physical science teachers and identified two categories of approaches to teaching: Conceptual Change/Student-focused (CCSF) and Information Transmission/Teacher-focused (ITTF). The CCSF approach is the combination of an intention to change students' conceptions and a student-focused teaching strategy (Trigwell, Prosser, and Taylor 1994). It was shown in an empirical study that teachers' student-focused approach to teaching is associated with a deep approach to learning of the students (Trigwell, Prosser, and Waterhouse 1999). The ITTF approach comprises an information transmission intention and a teacher-focused teaching strategy (Trigwell, Prosser, and Taylor 1994). A mixed-method study conducted in Finland revealed that only some university teachers hold either a purely student-focused approach to teaching or a purely teacher-focused approach; most teachers employ a dissonant approach to teaching, meaning that their teaching consists of elements from both the student-focused and teacher-focused approaches (Postareff et al. 2008). Similar results were also found in another mix-method study conducted by Stes and Van Petegem (2014) in Belgium.

While teaching in teacher education, teacher educators unpack existing teaching practices, make them learnable for student teachers, and help them to obtain deeper cognitive development, meanwhile avoiding reducing the learning process into simple learning of knowledge (Ball and Forzani 2009; Grossman, 2007). Teacher educators need to be able to recognise and analyse the different teaching situations and student teachers' learning needs to demonstrate the appropriate approaches to teaching (Tubić and Hamiloğlu 2009). A study of 524 university-based teacher educators in the USA indicated that teacher educators implement more versatile teaching methods and student-focused teaching strategies than teachers in other faculties to provide student teachers with the chance to experience teaching situations (Goubeaud and Yan 2004).

It is expected that teachers' research-teaching nexus is related to the way they approach teaching. This is also the case for teacher educators. From a curriculum perspective, Healey (2005a) described four forms of teaching based on the different understandings of research-teaching nexus. One survey study involving teachers in Netherlands

and China has shown that the more teachers conceive of teaching in a student-focused manner, the more they value the role of research in teaching (Hu et al. 2014). Another quantitative study conducted with teacher educators in China reported similar findings that the student-focused teacher educators perceive a closer research-teaching relationship than the teacher educators with a less student-focused approach (Cao et al. 2019). Teachers' research-teaching nexus takes different forms (Visser-Wijnveen et al. 2010), which mirror their intention of teaching in a variety of ways. This intention could then be related to teachers' strategies to approach teaching. For example, teachers' action to either present the basic knowledge of research in teaching or encourage students' active involvement in research during teaching, reflects their approaches to teaching to be either teacher-focused or student-focused (Visser-Wijnveen et al. 2012).

On one hand, research-teaching nexus and approaches to teaching are dependent on contextual factors such as the teaching goals, tasks and environments, as well as the institutional contexts and supporting strategies for teachers (Brew 2010; Prosser et al. 2003). On the other hand, they may change even within the same individual because they are also influenced by the individual's perceptions and experiences of teaching, learning and research (Brew 2003; Neumann 1992; Robertson 2007). Teacher educators are the professionals who perform teaching and conduct research on teaching and learning, and further integrate these two to promote student teachers' learning. However, this promotion is not likely to be gained unless research is integrated into teaching in a systemic way (Afdal and Spernes 2018). In this regard, it is necessary to explore teacher educators' research-teaching integration and how it is related to their approaches to teaching.

Research-based teacher education in Finland

The research-based approach is the main theme in Finnish teacher education and the development of teacher education, which has been emphasised systematically by universities and the Finnish Ministry of Education and Culture. It is an overall principle that all the teacher education programmes follow, and all the courses are related to research in multiple ways (Toom et al. 2010). In addition, it has been supported quite recently by the Teacher Education Forum in Finland established by the Ministry of Education and Culture that launched research-based development programmes for teacher education and funding to enhance this development.

Finnish teacher educators' research expertise allows them to establish a useful nexus between research and their teaching practice, and conduct research-based teacher education (Niemi 2016; Toom et al. 2008). They apply the thinking and competencies acquired from research in teaching and in making educational decisions (Toom et al. 2008, 2010). The student teachers are encouraged to acquire research skills and develop critical thinking during their teacher education (Niemi 2016; Toom et al. 2008). Learning about research starts from the beginning of the teacher education programme, including reading research papers, learning research methods and writing empirical bachelor's and master's theses in educational sciences (Flores 2018; Kynäslähti et al. 2006). Educational theories are integrated with practice in various ways. The aim is to encourage student teachers to be reflective practitioners with an inquisitive attitude towards teaching, and to be able to base their pedagogical decisions on rational argumentations (Kynäslähti et al. 2006; Toom et al. 2010; Tryggvason 2009).

Aims and research questions

The aim of the present study is to explore Finnish teacher educators' research-teaching integration. The purpose is to identify the ways in which Finnish teacher educators integrate research with their teaching, and how this integration is related to their approaches to teaching.

The specific research questions and hypotheses are:

1. How do Finnish teacher educators report that they integrate research with their teaching?

It is hypothesised that among Finnish teacher educators, who are working in the research-based teacher education context and are expected to teach as well as research, a variety of ways of integrating research into teaching could be identified (Cochran-Smith 2005; Krokfors et al. 2011; Kynäslahti et al. 2006; Niemi 2016; Toom et al. 2008, 2010; Visser-Wijnveen et al. 2010).

2. What approaches to teaching do Finnish teacher educators report they have adopted?

It is hypothesised that in the Finnish context, teacher educators could apply both the student-focused and teacher-focused approaches to teaching, as well as the dissonant approaches to teaching to support student teachers' learning (Postareff and Lindblom-Ylänne 2008; Tubić and Hamiloğlu 2009).

3. How is Finnish teacher educators' research-teaching integration related to their approaches to teaching?

It is hypothesised that the ways they integrate research with their teaching are related to their approaches to teaching, i.e. their intentions to teach and the strategies they apply to achieve the intentions (Cao et al. 2019; Healey 2005a; Hu et al. 2014; Postareff and Lindblom-Ylänne 2008; Trigwell, Prosser, and Taylor 1994).

Methodology

Research context

Finnish teacher education has gone through major changes since the Teacher Education Act instituted in 1971. It was assigned to universities in 1974, which developed the high academic standard of teacher education (Niemi 2016). There are eight universities in Finland providing the five-year master's-level teacher education programmes. Primary teachers, subject teachers, home economics teachers, craft teachers, kindergarten teachers and special education teachers are educated in the programmes. Teacher education includes studies in three areas: educational sciences including theories; research methods and bachelor's and master's theses; general and subject-specific pedagogy and teaching practice. To become a qualified teacher in primary or secondary school, student teachers need to complete the 300 credits of a master's degree (Kansanen 2003).

The participants in the study were from all six teacher education programmes provided at the eight Finnish universities. Some participants worked on more than one programme. However, most of them reported working on primary teacher education ($n = 72$), followed by subject teacher education ($n = 43$), kindergarten teacher education ($n = 23$), special education ($n = 14$), craft teacher education ($n = 12$), and home economics teacher

education ($n = 8$). The courses described in the survey varied considerably, and covered study areas such as curriculum theory and evaluation, foreign language pedagogy, and thesis seminars. Various teaching methods were used in these courses, including lecturing, group discussion and individual learning. The number of student teachers involved in these courses ranged from a small group of four to more than 100, and they were in different phases of their programmes.

Participants

Finnish teacher educators have a high degree of autonomy in their profession, which requires them to have a thorough knowledge in their work (Tirri 2014; Toom and Husu 2018). They are academic professionals working at universities, and conducting research in teacher education is part of their job. They investigate, for example, student teacher learning, the pedagogies of teacher education, pupil learning, and teachers in different school contexts. They undertake research in research groups with their colleagues and publish research in scholarly peer-reviewed international journals and publications. They apply for competitive funding for research from a range of sources.

A total of 101 teacher educators participated in the study in 2015. Thirty-one were male (30.7%) and 68 were female (67.3%); two did not report their gender. Their age ranged from 26 to 71 years ($M = 51$; $SD = 10.47$). Seventy-eight participants (77.2%) held a doctoral degree, 20 (19.8%) possessed a master's degree, and three (3%) had a degree of another level. Their teaching experience varied from one to 39 years ($M = 16.16$; $SD = 10.71$). Ninety-three teacher educators (92.1%) held a formal teaching qualification, and eight (7.9%) did not. Twenty-eight teacher educators had the experience of university pedagogical training. Twenty-five of them acquired credits from university pedagogical courses, varying from two to 60 credits ($M = 16.68$; $SD = 17.97$). Ninety-nine participants reported the composition of their workload in percentages (teaching, research, administration and other tasks totalling 100%). Among them, 64 (64.7%) reported teaching more than conducting research in their everyday work, 23 (23.2%) reported doing research more than teaching, and 12 (12.1%) said that teaching and conducting research occupied equal amounts of time in their workload.

Measures and data collection

A survey questionnaire was used in this study. The research-teaching integration was investigated with three items developed by the authors. The first item asked teacher educators about the extent to which they considered themselves to be teachers and/or researchers. They gave responses ranging from '0% as a teacher and 100% as a researcher' to '100% as a teacher and 0% as a researcher'. The second item explored their evaluations of the intensity of their research-teaching relationship with a 5-point Likert scale from '1 = no link' to '5 = totally related'. Finally, they were asked to give specific examples of how they combined research with their teaching in an open-ended question. The questionnaire included the revised version of Approaches to Teaching Inventory (ATI-R; Trigwell, Prosser, and Ginns 2005) to investigate teacher educators' approaches to teaching on the student-focused and teacher-focused scales. They were measured with

a 5-point Likert scale from '1 = only rarely or never true' to '5 = almost always or always true'.

The Finnish version of the 16-item Approaches to Teaching Inventory (ATI; Trigwell and Prosser 2004) has been used in a previous study (Postareff, Lindblom-Ylänne, and Nevgi 2008). The ATI-R (Trigwell, Prosser, and Ginns 2005) included 22 items in total. The Finnish translation of ATI-R (Trigwell, Prosser, and Ginns 2005) used in the present study included the 16 items from the previous Finnish version. The other six items in English were translated into Finnish by the second and fourth authors. After translation, the Finnish version was pilot-tested by two Finnish scholars. Using their suggestions and a comparison between the translated version and the original, some word variations that did not influence the meaning of the items were found. The items were revised based on these differences.

To involve as many participants as possible, 826 teacher educators at the eight universities were contacted via their email address, and an electronic version of the questionnaire was available to all of them. A reminder email was sent two weeks later. Meanwhile, a paper version was sent to the teacher educators at two universities in line with their preference. They could answer the questionnaire with either the electronic or the paper version. The questionnaire was available in both English and Finnish. The participation of the study was voluntary. The aims of the study and instructions for answering the questionnaire were presented for helping the participants to make decisions of participation. Research consent was obtained when they returned the questionnaire. The ethical guidelines of research in Finland were followed (Finnish Advisory Board on Research Integrity 2012).

It should be noted that the research-teaching integration and approaches to teaching are context-bound and may vary because the individual teachers face different teaching contexts (Neumann 1992, 1994; Prosser and Trigwell 2006). The data would be difficult to handle if we asked them to report all the relevant teaching situations. Thus, the study focus was on teacher educators' research-teaching integration and approaches to teaching in one of their representative teaching situations as a typical example to illustrate the complex phenomenon. The participants were asked to think of a typical course or teaching context while answering the inventory. They were required to describe the course, including the names, teaching content and methods and the study level of the student teachers. Furthermore, the questionnaire was described as focusing on measuring the integration of research and teaching. Therefore, teacher educators who are not actively involved in research probably did not respond to the questionnaire. The response rate was 12%, but we were not aware of what the response rate is among teacher educators who are actively involved in research.

Data analyses

Firstly, the participants' mean scores for their perceptions of their teacher/researcher role, and the intensity of their research-teaching relationship, were calculated. Afterwards, a qualitative content analysis applying abductive strategy was employed to analyse their research-teaching integration (Timmermans and Tavory 2012).² The research-teaching integration was understood as the variety of ways teacher educators utilise when connecting components of research to components of teaching in their teaching.

Five categories of research-teaching integration drawn from previous studies were used as the starting point for the analysis (Cochran-Smith 2005; Krokfors et al. 2011; Visser-Wijnveen et al. 2010). Eighty-six answers were included in the analysis and were split into 159 analysis units (Graneheim and Lundman 2004). The analysis process went through the stages of defining categories and coding, a revision of the categories and creation of the sub-categories (Table 1). The study process and report of results followed the work of Elo et al. (2014), and Graneheim and Lundman (2004) to increase its trustworthiness.

In the first phase, the first, second and fourth authors defined the five categories according to previous studies. The first author read all the answers repeatedly to obtain a sense of the whole and the descriptions of research-teaching integration were extracted. The text was then divided into analysis units. One analysis unit contains one or several sentences that cover one central meaning (Graneheim and Lundman 2004; Stemler 2001). The first author compared the analysis units and classified most of them into the five categories, but also identified some descriptions which could not be placed into any of the existing categories. The three authors read through the descriptions that were not yet placed into the five categories and after discussing them in depth, a few of them were placed in the five categories. In the second phase, the three authors discussed the remaining descriptions and created a new category. Thereafter, the first author went through all the descriptions again to make sure no more categories could be identified (Hickey and Kipping 1996; Stemler 2001). In the third phase, according to the different aspects the participants stressed in their answers, the six categories were further analysed, and the sub-categories were formed by the first author. Afterwards, the second and fourth authors analysed all the answers separately for the second time and agreed with the first author about the main and sub-categories. The creation of the sub-categories was discussed in depth by the three authors. The analysis units were put into an exclusive analysis category. Quotations were chosen to give examples of a typical response and to illustrate the point of the category (Elo et al. 2014; Taylor-Powell and Renner 2003).

The relationship between teacher educators' research-teaching integration and approaches to teaching was explored. Firstly, two sum scales for student-focused and

Table 1. Category and operational definition of the category.

Category	Operational definition
1. Teaching content is based on research	Teacher educators use their own or others' research as their teaching content to transfer academic knowledge to student teachers and develop the student teachers' independent thinking (Visser-Wijnveen et al. 2010).
2. Teaching methods and course design are based on research	Teacher educators benefit from their research work in teacher education and develop their teaching methods accordingly (Cochran-Smith 2005; Krokfors et al. 2011).
3. Applying inquiry-oriented methods in teaching	Teacher educators organise the course based on inquiry-oriented activities to guide student teachers to learn in an analytical and inquiring way to develop their pedagogical thinking (Krokfors et al. 2011).
4. Acting as researchers in teacher education	Teacher educators work as researchers and conduct research on what and how they teach, and on topics in teacher education (Cochran-Smith 2005).
5. Encouraging student teachers' involvement in research work	Teacher educators involve student teachers in research process to provide them with the experience of conducting research (Visser-Wijnveen et al. 2010).
6. A supportive relationship between research and teaching	Teacher educators consider the research-teaching nexus is complementary and fairly evident. Teaching and research support each other in a general and broad sense.

Note. Category 1–5 were drawn from previous studies, category 6 was developed by the authors.

teacher-focused approaches to teaching were determined with an exploratory factor analysis (principal axis factoring with Promax rotation). Teacher educators were grouped into three clusters using a two-step cluster analysis concerning their different approaches to teaching. Next, one-way ANOVA was applied to compare the three clusters about their perceptions of their teacher/researcher role and the intensity of their research-teaching nexus. Finally, the main categories of research-teaching integration were coded into dummy variables and Chi-square tests were applied to detect the association between research-teaching integration and the clusters.

Results

Finnish teacher educators' research-teaching nexus

Teacher educators' perceptions of their teacher/researcher role were estimated with percentages (Table 2). Furthermore, they were asked about how closely they thought their research and teaching were related to each other ($M = 4.00$, $SD = .82$). 77.2% of the participants believed that their research and teaching were closely related, including the answers 'highly related' and 'totally related' (Table 3).

Integration of research and teaching among Finnish teacher educators

We analysed the participants' descriptions of their research-teaching integration and counted the frequency of each category (Table 4). Categories 1 to 5 are divided from Category 6 because the descriptions in the first five categories include specific examples of how the participants integrate research and teaching. Category 6 describes an evident research-teaching nexus at a more general level. The orientation of integration in Categories 1, 2 and 3 is from research to teaching and teacher educators focus on the issue from the teaching point of view. In Categories 4 and 5, the orientation is from teaching to research, and teacher educators' researcher role is more active. Category 1 concerns the integration of research with what teacher educators teach

Table 2. The distribution of teacher educators on their perceptions of the teacher/researcher role.

Perceptions of teacher/researcher role	N	Percentage (%)
More researchers than teachers	20	19.8
More teachers than researchers	49	48.5
As much researchers as teachers	32	31.7

Table 3. The distribution of teacher educators on their perceptions of the intensity of the research-teaching relationship.

Intensity of their research-teaching relationship	N	Percentage (%)
'No link between them'	1	1.0
'Loosely related'	4	4.0
'Partly related'	15	14.9
'Highly related'	51	50.5
'Totally related'	27	26.7
Missing answer	3	2.9

Table 4. Main and sub-category of the research-teaching integration.

Main category (frequency)	Sub-category (frequency)
1. Teaching content is based on research (59)	1.1 General information of research in a certain field is introduced in teaching (21) 1.2 Teaching content is based on one's own research (37) 1.3 Teaching content is based on other's research (7) 1.4 Research papers are used in teaching (9)
2. Teaching methods and course design are based on research (8)	
3. Applying inquiry-oriented methods in teaching (7)	
4. Acting as researchers in teacher education (30)	4.1 Doing research on one's own teaching practice (9) 4.2 Doing research on one's teaching content (11) 4.3 Doing research on teacher education (13)
5. Encouraging student teachers' involvement in research work (17)	5.1 Supporting and supervising student teachers' theses writing (12) 5.2 Encouraging student teachers' involvement in research process (6)
6. A supportive relationship between research and teaching (6)	

(the content) and student teachers learn about research. In Categories 2 and 3, the integration occurs between research and how teacher educators teach (the method) and student teachers learn in a research-based way. Category 2 describes research-teaching integration which happens in specific forms, while Category 3 includes the integration which is more diffuse. In Category 4, teacher educators' teaching influences their research content. Furthermore, the activities happen mainly among teacher educators with less involvement with student teachers. Category 5 comprises research-teaching integration which directly involves student teachers' active participation.

1. Teaching content is based on research

Fifty-nine teacher educators reported that the contents of their teaching are based on research, which was the most frequently mentioned form of research-teaching integration (see Table 4). In this way, teacher educators transferred academic knowledge to student teachers. Their experience as researchers helped them to select the suitable content for the course. With the integration, teacher educators got the chance to reflect on the topic they have been teaching, and student teachers familiarised themselves with the research. Even though teacher educators in this group applied the same way to integrate research with teaching, i.e., to integrate research with teaching content, with the different keywords mentioned in their answers, the aims and intentions they had for teaching were very different.

Twenty-one teacher educators mentioned providing student teachers with the general information and knowledge of research in the field to show them what had been explored and current research trends (Sub-category 1.1). The aim was to reveal a more comprehensive picture of the field for student teachers in the course.

In the discussions I bring up the kinds of research project related to the topic of the course that are going on. Or what we have previously explored related to the topic. (A subject didactics course for subject student teachers)

Thirty-seven teacher educators reported presenting their own research in teaching as examples to illustrate the issues in the area (Sub-category 1.2). Because they were the first-site researchers and familiar with their own research, teacher educators were able to present the details, such as research methods, processes, results, and unsolved issues to the student teachers. The aim was to familiarise student teachers with the knowledge and skills about how to conduct research in real settings and inspire them to think about the challenges that need to be solved in the field.

I use my own research as a strong basis for my teaching, which focuses on the core content of my teaching. For example, my research on the teaching, studying and learning of foreign languages in Finnish classrooms triggers students to think about the essential pedagogical challenges in language teaching and even finding solutions to irrelevant models of teaching through their own ideas. (A pedagogical content knowledge course for craft student teachers)

Seven teacher educators reported presenting other researchers' research in their teaching (Sub-category 1.3). The research integrated into the courses broadened the scope of the content and provided different insights, because they were relevant to the teacher educators' own research used in class but had a different focus.

I give examples of others' research as a basis for joint pondering. I can bring up some issues related to research which need to be considered, for example, in collecting questionnaire data from older people. (A course for kindergarten student teachers)

Nine teacher educators emphasised utilising research papers in teaching (Sub-category 1.4), either as reading materials used during class or as supplementary materials for assignments after class. Student teachers read scholarly articles and reflected on the relevant issues in the courses. Through literature reading, teacher educators aimed to encourage student teachers to think critically and independently, and familiarise them with academic writing and how to present research results.

... A good practice that students have liked is to utilise such well-written course literature in which the author has prepared a meta-analysis of the topic. (An educational theory course for primary and subject student teachers)

2. Teaching methods and course design are based on research

Eight teacher educators reported that their teaching methods during the course and whole course design, i.e., the way they teach, were based on research. They conducted research on teaching methods, and thus, their pedagogy, teaching methods and principles were developed directly according to the research results. Furthermore, they mentioned that their involvement in research enabled them to access to recent research on how something can be taught, and they adapted their teaching accordingly. In other words, teacher educators utilised their teaching task as the site to put research results into practice.

I develop the course in line with the results I have found in my own research, for instance by acknowledging learning-as-participation. (A pedagogical content knowledge course for primary student teachers)

3. Applying inquiry-oriented methods in teaching

Seven teacher educators mentioned designing their teaching in an inquiry-oriented way. The teaching normally started with early studies of others, then the student teachers were instructed to either test the theory of others or investigate the work of their own. The teaching was analytical and systematic. Teacher educators guided and gave feedback to student teachers, who were active participants in the learning activities. The aim was to relate theoretical research results to practical actions, develop both teacher educators' and student teachers' critical thinking, improve student teachers' independent pedagogical thinking and cultivate them to be inquiry-oriented towards their work.

... Actually, many themes are structured, and I can even try the functionality of certain 'hypotheses' with students. For example, elaborating on current phenomena with students by utilising the theory contributes to the development of students' thinking and tests the functionality of the theory in the analysis of various phenomena. We can also consider other theories and compare their usability, when both my own and the students' critical thinking develops. (An educational theory course for kindergarten student teachers)

4. Acting as researchers in teacher education

Thirty teacher educators described their experience as researchers in teacher education. Their researcher role was active, the knowledge and skills they ought to have as researchers were stressed. The themes of their research described in the study focused mainly on three domains, their own teaching practice, the content they are teaching, and the topics in teacher education which are related to their present teaching work.

Nine teacher educators described their work of practitioner research exploring how they teach (Sub-category 4.1). They developed their own teaching and philosophy accordingly. It was a constant process in which teacher educators made well-organised teaching plans before starting to teach. They developed it towards action research, worked alone or with their colleagues, and paid close attention to how student teachers' learning progressed during the course.

I develop my teaching practices all the time. I present them based on the theories in conferences, so I receive scholarly feedback on them. Next, I write the paper, publish it and receive feedback again. In this way, I can develop my teaching further. Actually, my teacher-researcher model is like design-based research. Sometimes the theories are formed and emphasised differently in the theoretical framework. (A subject didactics course for primary student teachers)

Eleven participants reported conducting research on topics related to their teaching content (Sub-category 4.2). For these teacher educators, their research focused on what they teach, not how they teach. They advanced the subject of their teaching through their research on it.

I partly explore what I teach, through practical work. My research is about designing and manufacturing clothes, just like my teaching. (A pedagogical content knowledge course for craft student teachers)

Thirteen teacher educators mentioned that their research focused on themes in teacher education and teaching in general. The research topics were related to their present teaching in some way, thus, they collected data from their student teachers and

courses through questionnaires and observations (Sub-category 4.3). The research-teaching integration appeared in a way that the courses and teaching were the research site from which teacher educators obtained their research inspiration and first-hand data.

My research aim is to study teachers' professional growth and I collect data from my teacher students. I collect metaphors and short memories from school and sometimes some essays. (A subject didactics course for subject student teachers)

5. Encouraging student teachers' involvement in research work

Thesis writing is an important part of student teachers' programmes, correspondingly, 12 teacher educators emphasised the supervision of their student teachers to write theses or course assignments (Sub-category 5.1). For example, teacher educators shared data with student teachers so they could use it in their bachelor's or master's theses. Teacher educators expected student teachers to develop research interests in the research themes they worked on. They supervised student teachers in academic writing, and student teachers were involved in one aspect of the research process (reporting research results). Teacher educators' experience of academic writing helped them to instruct student teachers to do the same thing. They mentioned that by doing this, they deepened their own understanding of the research subject.

I have made students do master's thesis and other seminar work, which at the same time deepens my own knowledge about the topic that I am exploring. (A pedagogical content knowledge course for primary student teachers)

Six teacher educators mentioned involving student teachers in the research process, for example, by collecting data with them (Sub-category 5.2). Teacher educators encouraged their student teachers to have a deeper experience of conducting research. They were researchers and role models to provide student teachers with research experience. Student teachers were challenged and improved concerning their research competence, were introduced further to the discipline, and got the chance to be active practitioners in the field. Teacher educators were not only supervisors but considered student teachers to be researchers in their research group, and perceived student teachers as being engaged in their research community.

I investigate marginalisation, and many students participate in my research by collecting data and utilising it in their thesis. (A thesis course for special education student teachers)

6. A supportive relationship between research and teaching

Different from the five aspects mentioned above, six teacher educators in the study did not describe tangible examples of integrating research with teaching. Instead, they elaborated a supportive and fairly evident relationship between their research and teaching.

Generally speaking, on one hand, teacher educators' research could benefit from their teaching tasks. Teaching broadened their minds on general topics that may not directly relate to their research, and they benefitted from the interaction with student teachers. They reported that teaching helped them to develop their critical thinking, and they got ideas and inspiration from teaching to improve their research work. On the other hand,

teacher educators' research work could also support their teaching. They obtained new viewpoints and educational theory from research to support their teaching. They reflected on and improved their teaching constantly. In this way, their teaching kept up with the changing requirements of student teachers and society.

... Teaching is emphasised in my position as a university teacher. In terms of my teaching, I can also develop my scientific thinking. ... (An educational theory course for kindergarten student teachers)

... This helps me to reflect on and to develop my own teaching, but also connects my practice to educational theory, a goal I have for my students. ... In this way, I am developing my own understanding of my students. This helps me to keep my course up-to-date and helps me to use my resources wisely. (A pedagogical content knowledge course for primary student teachers)

The relationship between research-teaching integration and approaches to teaching

The ATI-R (Trigwell, Prosser, and Ginns 2005) is perceived as a valid instrument to explore approaches to teaching. However, approaches to teaching are contextually dependent (Prosser and Trigwell 2006). Thus, the validity and reliability of the inventory were explored in the new research context. An exploratory factor analysis (principal axis factoring with Promax rotation) was conducted to obtain the factor structure of the inventory. The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy index was .74 and indicated the appropriateness of the analysis. The scree test was used, and two factors were retained with the cumulative variance extracted of 37.09% (Cattell 1966). Exploratory factor analyses with three- and four-factor solutions were also conducted. The item loading tables were compared, and the two-factor solution revealed the cleanest factor structure (Costello and Osborne 2005). Meanwhile, an intention of the study was to explore approaches to teaching on the two broad student-focused and teacher-focused scales (Trigwell, Prosser, and Taylor 1994). Therefore, the two factors retained were seen as interpretable and appropriate. Items were left out of the scales due to their low communalities and because the reliability of the scales increased after they were deleted. Finally, a student-focused approach to teaching scale with nine items and a Cronbach's α of .84, and a teacher-focused approach to teaching scale with eight items and a Cronbach's α of .77, were revealed. Following Tabachnick and Fidell's (2001) suggestion, items with loadings of .32 and above were interpreted. The factor loadings of the selected items were between .39 and .83 (Appendix A).

Table 5. Means and standard deviations of the three clusters on the CCSF and ITTF scales.

	CCSF		ITTF	
	M	SD	M	SD
Cluster 1 (n = 38)	4.68	.23	2.27	.37
Cluster 2 (n = 32)	4.73	.23	3.42	.37
Cluster 3 (n = 31)	3.73	.42	3.14	.53

Note. CCSF = the student-focused approach to teaching; ITTF = the teacher-focused approach to teaching.

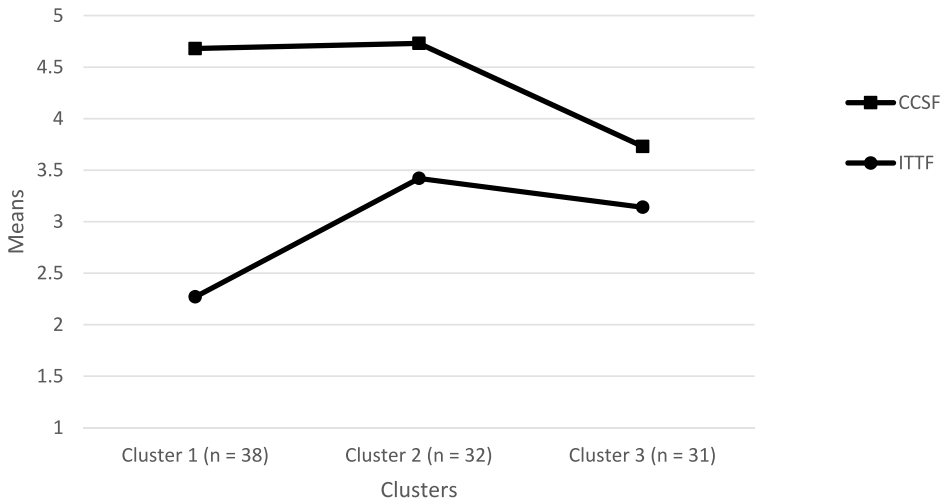


Figure 1. Means of three clusters on the CCSF and ITTF scales. Note. CCSF = the student-focused approach to teaching; ITTF = the teacher-focused approach to teaching.

Table 6. Post-hoc comparisons between the three clusters.

	CCSF		ITTF	
	t	p	t	p
Cluster 1 – Cluster 2	–1.00	.319	–13.00	< .001
Cluster 1 – Cluster 3	11.83	< .001	–8.06	< .001
Cluster 2 – Cluster 3	11.76	< .001	2.45	.017

Note. CCSF = the student-focused approach to teaching; ITTF = the teacher-focused approach to teaching.

Finnish teacher educators scored highly on the student-focused approach to teaching scale ($M = 4.40$, $SD = .54$), and lower on the teacher-focused approach scale ($M = 2.90$, $SD = .66$). Two-step cluster analysis was used to classify teacher educators based on how they adopted the student-focused and teacher-focused approaches. Three clusters were identified with the lowest BIC coefficient of 117.40 and the largest ratio of distance measures of 2.41 (Table 5; Figure 1).

Comparisons of the three clusters were conducted to see how they differed from each other (Table 6). Cluster 1 had a high score on the student-focused approach to teaching scale and the lowest score on the teacher-focused approach scale, so it was named *teacher educators with a student-focused approach to teaching*. These teacher educators approached their teaching in a consistently student-focused way to support student teachers' activities in learning and knowledge construction. Cluster 2 was labelled *teacher educators with a dissonant approach to teaching* since they scored highly on both the student-focused and teacher-focused approaches. While teaching the course, although they stressed their student teachers' active participation in learning, they also emphasised their roles as knowledge authorities. Cluster 3 was named *teacher educators with a vague approach to teaching*, because they had the approximate scores on the two scales.

Table 7. Percentage (frequency/participants) of the main category per cluster.

Category	Percentage (%)		
	Cluster 1 (n = 35)	Cluster 2 (n = 27)	Cluster 3 (n = 24)
1. Teaching content is based on research	71.4	70.4	62.5
2. Teaching methods and course design are based on research	14.3	3.7	8.3
3. Applying inquiry-oriented methods in teaching	17.1	0	4.2
4. Acting as researchers in teacher education	31.4	29.6	45.8
5. Encouraging student teachers' involvement in research work	14.3	22.2	25
6. A supportive relationship between research and teaching	5.7	11.1	4.2

Note. Cluster 1 = Teacher educators with a student-focused approach to teaching; Cluster 2 = Teacher educators with a dissonant approach to teaching; Cluster 3 = Teacher educators with a vague approach to teaching.

Compared to the first two clusters, Cluster 3 did not show a clear preference towards either of the two approaches.

Regarding the research-teaching integration, one-way ANOVA revealed that there was no difference between the clusters concerning how they perceived their roles as teachers and/or researchers ($F(2, 98) = 1.23, p = .297$). No difference was found between the three clusters about their perceptions of the intensity of their research-teaching relationship ($F(2, 98) = 1.42, p = .246$). The percentage (frequency/participants) of the main categories describing how teacher educators integrated research and teaching were calculated per cluster (Table 7). Teacher educators with different approaches to teaching had a varied preference for the forms of research-teaching integration. For instance, teacher educators with a vague approach to teaching (Cluster 3) mentioned integrating research with their teaching content less often than teacher educators with a student-focused approach (Cluster 1) and those with a dissonant approach (Cluster 2). The variation of research-teaching integration also appeared in other categories. However, these differences between the clusters were not statistically significant in the Chi-square tests.

Discussion

Teacher education varies across the world with regard to systems, policies and development strategies. However, teacher educators worldwide share some similar experiences when engaging in research and face with challenges alike when they attempt to accomplish their diverse roles (Gunn et al. 2016; Hill and Haigh 2012; McNicholl and Blake 2013). The present study is located in the distinctive Finnish teacher education context and analysed the research-teaching nexus and integration of the university-based teacher educators, but yields insights for teacher educators to improve their professional practice in teaching and research locally and globally at a broad level.

The study explored Finnish teacher educators' research-teaching integration by firstly revealing their perceptions of their teacher/researcher role and the intensity of their research-teaching relationship. 48.5% of the participants perceived themselves more as teachers than researchers. However, the aim was not to compare the two roles, but rather to investigate the emphasis and variety among the teacher educators. Nevertheless, it was expected that teacher educators would prioritise their teaching role because they are teachers in teacher education and shoulder the responsibility of educating future teachers (Swennen, Jones, and Volman 2010). Teacher educators' perceptions of their roles could

be related to the work composition they reported. Teaching and conducting research were the two main parts of the participants' work. Meanwhile, the largest proportion (64.7%) reported teaching as their principal job. Teacher educators could have a preference for what work they would like to do (Hattie and Marsh 1996). However, they all need to complete the work the university assigns to them. This reality raises the importance of the proper positioning and development strategies the university formulates for teacher educators to fulfil their job as teachers and researchers. It is also indicated that the institutional strategies have considerable influence on enhancing teachers' research-teaching nexus (Hattie and Marsh 1996). In the study, 77.2% of the participants perceived that their research and teaching were closely related. This means that despite considering teaching as their primary task, teacher educators emphasised the relationship between research and teaching. The tight research-teaching relationship could be attributed to the research context that there is a long tradition of Finnish teacher educators conducting research and further implementing the research-based approach in teaching (Kansanen 2003; Toom et al. 2010).

An important outcome of the study is that new knowledge about teacher educators' research-teaching integration has been generated. The first hypothesis was confirmed with six ways of research-teaching integration being revealed in the study (research question 1). Integrating research with teaching content was the most direct and basic way to relate research with teaching. The research-teaching nexus was tangible because the focus was on the transfer of research knowledge from teacher educators to student teachers (Neumann 1992). While teaching, teacher educators stressed the different kinds of research knowledge they would like their student teachers to acquire. This might be because the study did not limit the courses the participants could report. For instance, teacher educators may present general research knowledge for junior student teachers to capture a whole picture of the field (Sub-category 1.1). Moreover, they would like the senior student teachers to learn how to conduct research by showing the details of their research (Sub-category 1.2) (Kansanen 2014). Two aspects of research-teaching integration were concerned with teacher educators' teaching methods. The benefit from research on teaching that is unique to teacher educators is that they can improve their teaching methods, i.e. how they teach, based on their research results. Furthermore, inquiry-oriented learning is emphasised when teacher educators engage student teachers in the learning process that is similar to the research process (Buckley 2011). The research-teaching nexus was intangible since it influenced student teachers' attitudes to knowledge and how they pursue knowledge (Neumann 1992). However, the implementation of inquiry-oriented teaching requires some prerequisites and requires more of the teacher educators (Towers 2010), thus it is not a common form of integrating research and teaching.

Teacher educators are researchers conducting research in teacher education. Like university teachers in other disciplines, they can improve their understanding of their teaching since what they study and what they teach can have the same content. Besides that, teacher educators can work as practitioner researchers and directly study their own teaching practice (Berry 2004). Meanwhile, teacher educators' research can broadly include themes in teacher education and teaching in general (Lunenberg 2010). Their teaching thus functions as a research site for them to collect data and materials. Involving student teachers in research is an important form of research-teaching integration,

especially when the research-based and inquiry-oriented approaches are stressed in student teachers' studies (Niemi and Nevgi 2014). Nonetheless, in the present study context, the aim was not to prepare student teachers to be future researchers. They were educated as researchers to learn how to apply the competence that they gain from research to teaching (Toom et al. 2010).

The data in the study revealed that in many cases, one teacher educator applied more than one way to integrate research and teaching. In addition to conducting research, teacher educators need to know how to use research to develop their teaching and their student teachers' learning (Kansanen 2014). Research and teaching are not two separate tasks for teacher educators. Instead, they are closely related and in a mutually reinforcing relationship (Robertson 2007), especially in the present research context of research-based teacher education. The ways of research-teaching integration revealed in the study correspond with the research-based teacher education emphasising that every component in teacher educators' teaching is scientific and evidence-based (Kansanen 2014).

After exploring the research-teaching integration, the study focused on how this integration was related to the ways teacher educators approach teaching. Like previous studies (Postareff et al. 2008; Stes and Van Petegem 2014), this study also revealed the consonant and dissonant approaches to teaching among teacher educators. However, our second hypothesis was only partly true because the teacher-focused approach to teaching was not found (research question 2). The explanation of the student-focused approach to teaching could be related to the nature of the discipline. Teacher education is seen as a soft discipline in which the approaches to teaching are more likely to be student-focused (Lindblom-Ylänne et al. 2006). Furthermore, teacher educators need to combine the student-focused and teacher-focused approaches to fulfil student teachers' learning needs (Ball and Forzani 2009; Grossman, 2007), which makes their teaching dissonant. It is noteworthy that compared to the other two clusters (Clusters 1 and 2), one group of teacher educators (Cluster 3) did not report a clear preference towards either the student-focused or the teacher-focused approach to teaching. However, this does not indicate their orientation in teaching in general. The approaches to teaching are context-dependent (Prosser and Trigwell 2006), meaning that these teacher educators showed no preferred approach to teaching in the particular course/teaching context they reported in the study. They may apply a different approach in another teaching situation.

How teachers link research and teaching mirrors their perceptions of knowledge creation and transmission (Brew 2003). Thus, our third hypothesis was that teacher educators' research-teaching integration could be related to how they approach teaching (research question 3). The intention was to provide teacher educators with some suggestions to integrate research into teaching in a more student-focused approach. However, the third hypothesis was not confirmed, which illustrates well the complex nature of teacher educators' research and teaching work. Regarding teacher educators' perceptions of their teacher/researcher role and the intensity of their research-teaching relationship, the reason for the insignificant results could be the limited variation in their answers to the two questions. Variations in the ways of research-teaching integration can be observed among teacher educators with different approaches to teaching. Despite that, the differences between the clusters on their research-teaching integration were not statistically significant. One reason for this result may be due to the small sample size.

Another potential reason is the approaches to teaching revealed in the study. It might be the case that if teacher educators apply clearly either the student-focused or the teacher-focused approach to teaching, the relationship between research-teaching integration and approaches to teaching could occur. However, the quantitative analysis did not reveal a purely teacher-focused approach to teaching. In the approaches to teaching revealed in the study, two are combinations of the student-focused and teacher-focused approaches (Clusters 2 and 3). This means that many teacher educators in the study would apply multiple kinds of intentions and strategies to teaching, which could lead to an application of multiple ways to integrate research with teaching to support their teaching. Thus, the relationship between research-teaching integration and approaches to teaching was not found.

Methodological reflections

A survey questionnaire was applied to search for answers to the three research questions. Survey research can be designed for exploring how things are at a specific time and providing data for exploring the relationship between variables (Kelley et al. 2003). We applied three items to explore teacher educators' research-teaching integration. Because the data were collected through the participants' self-reporting, there was limited knowledge of how they conceptualised what they actually do. Nonetheless, the open-ended question allowed the participants to use their own words to describe their ideas and practices of research-teaching integration and enabled a more qualitative approach to investigate the phenomenon.

The study results need to be interpreted after considering the dependency of research-teaching integration and approaches to teaching in the contexts they occurred (Neumann 1992, 1994; Prosser and Trigwell 2006). Teacher education programmes vary between countries, so caution must be exercised in generalising the results broadly. Firstly, Finnish teacher education provides teacher educators with a great deal of autonomy in teaching, and we sampled their research-teaching integration from one of their many courses. The study revealed six ways to integrate research and teaching (research question 1), but no conclusions can be drawn about the extent to which the six categories would occur. Nonetheless, in light of our study, teacher educators may consider the options and how to integrate research and teaching concerning their own situations to diminish the possible research-teaching conflict. Secondly, three kinds of approaches to teaching were revealed with the ATI-R (Trigwell, Prosser, and Ginns 2005) (research question 2). As clarified by the developers of the inventory that ATI (Trigwell and Prosser 2004) and ATI-R (Trigwell, Prosser, and Ginns 2005) are not designed to assess teachers' general orientations in teaching (Prosser and Trigwell 2006). Thus, the study revealed teacher educators' approaches to teaching in the particular context. The study did not reveal a statistically significant relationship between teacher educators' research-teaching integration and their approaches to teaching (research question 3). The possible reasons were discussed above, which provided some insights on future research to answer this question.

Implications for future research

A questionnaire was used in the study to expand the scope of participation. However, the response rate was low. The reason might be that it was explained to the participants that one aim of the study was to investigate teacher educators' research-teaching integration, so only those teacher educators with research duties answered the questionnaire. Future studies could apply other supplementary methods, such as interviews and observations, to acquire detailed data. Furthermore, an alternative research design could be applied to investigate this issue, for example, according to the different levels, aims and nature of the courses (Neumann 1992, 1994). The results from the current study only represented teacher educators' research-teaching integration based on one of their courses. Enquiry into the changes of their research-teaching nexus over time and in different contexts is recommended to capture the whole picture. The nature of the present study did not lend itself to explaining why teacher educators chose certain ways to integrate research and teaching. Therefore, research investigating teacher educators' reasons for their choices is strongly recommended. Furthermore, ways to encourage teacher educators to participate in research should be devised. For example, instant feedback from the study results to the participants could be guaranteed to improve their participation in the study.

Implications for practice of teacher educators

Professional learning initiatives have been developed to build teacher educators' capacity for their research work and other tasks (MacPhail et al. 2019; Murray and Vanassche 2019). Based on the present study, we argue that instead of regarding research and teaching as separate sections, they should be considered to be integrated activities. Furthermore, the professional development activities need to be individualised to teacher educators according to their specific background, experience and expectation. For instance, for teacher educators who perceive themselves more as teachers and with a leaning to teaching, the suggested professional development activity for their research capacity needs to be consistent with their needs in teaching (Geerdink et al. 2016). Besides the external encouragement for teacher educators to conduct research, they may be more willing to engage in research if they know research is aligned with their teacher education responsibilities and helpful to inform their teaching as teacher educators (MacPhail and O'Sullivan 2019).

According to the forms of research-teaching integration identified in the study, we have some suggestions for teacher educators to link research and teaching as interrelated activities. For example, compared with teaching content, teacher educators need to be encouraged more in integrating research with teaching methods, using research to improve the way they teach and keeping up with the learning requirements of the student teachers. Their application of inquiry-oriented methods in teaching should also be encouraged. In the inquiry-oriented learning, high-quality guidance and supervision from teacher educators are very important to ensure that student teachers have a good learning experience (Niemi and Nevgi 2014). Meanwhile, teacher educators need to create a learning environment with space and freedom for student teachers to be more actively involved in research to encourage their deep learning (Niemi 2016). Participants in the study stated that they hoped their student teachers could develop interests in the

research topics they were studying. While the research assignments teacher educators give student teachers could be related more directly to the student teachers' future work (Afdal and Spernes 2018). The focus should be on relating the educational notions and theories in the current research assignments to the practical work of teachers. In this sense, to implement the research-teaching integration is not only for the sake of teacher educators but especially for providing research-based teacher education and supporting student teachers' learning. Teacher educators have positive attitudes towards conducting research on their own teaching, so further attention should be paid to how they can utilise their research results to improve their teaching. The current study focused on research-teaching integration based on teacher educators' teaching role, and on how the integration could influence their teaching. It would be important to pay more attention to the impact of teaching on research.

Teacher educators employ multiple ways to integrate research and teaching during one course, and these ways need to be related to each other systematically. For example, the research papers teacher educators used in their teaching content earlier could be suggested to student teachers using in their research projects later. In this way, the student teachers could deepen their understanding of the educational theory in the paper by applying them in real research settings (Afdal and Spernes 2018). The intentions and aims of research-teaching integration need to be made more explicit to both teacher educators themselves and student teachers (Aspfors and Eklund 2017). Participants in the study elaborated a complementary and fairly evident research-teaching relationship without giving any specific examples. There is a danger that they may not actually know what they would like to achieve when implementing research-teaching integration because they would think that the reinforced influence between research and teaching are self-evident and happen naturally.

Even though our study failed to reveal the relationship between research-teaching integration and approaches to teaching (research question 3), it is argued that research is a promising activity to educate student teachers, and the effect can only be achieved when research is integrated with teacher education programmes and teacher educators' teaching activities in a meaningful and systematic way (Afdal and Spernes 2018). It depends largely on the teacher educators to ensure the process. Teacher educators sometimes base their teaching on personal experience rather than educational theory (Lunenberg, Korthagen, and Swennen 2007). Thus it is strongly recommended that they raise the awareness of how they approach teaching and relate their practice of teaching to theoretical notions. The ATI-R (Trigwell, Prosser, and Ginns 2005) could be used as a tool for teacher educators to conceptualise their approaches to teaching and reflect on their teaching constantly, furthermore, to check the variation of their approaches to teaching when they integrate research into teaching in different ways. The improvement of approaches to teaching is a continuous process.

Previous studies have demonstrated the problematisation of research in teacher education and concerns of teacher educators engaging in research (Gunn et al. 2016; Hill and Haigh 2012; McNicholl and Blake 2013). The present study contributes to this discussion, similar to other international research, by suggesting that an enhanced research-teaching nexus can be built in teacher education. It is guaranteed with sufficient support from the university at the institutional level and the

implementation of the research-teaching integration from the teacher educators at the individual level.

Notes

1. Clarification on the terminology: By 'teacher educator(s)', the study refers to the teachers working in the teacher education programmes in the university context. Accordingly, by 'student teacher(s)', the study refers to the students studying in teacher education to become teachers. Meanwhile, by 'teacher(s)' and 'student(s)', the study refers to the teachers and students in the educational context generally.
2. With the abductive strategy, the analysis starts with existing rules and theories generated from previous studies, then proceeds with the analysis of a collection of cases to find a fit between the cases and the rules, seeking for a verification of the existing rules and theories, or producing new rules and theories with an inductive analysis (Timmermans and Tavory 2012).

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Appendix A

Scales of ATI-R (the revised version of Approaches to Teaching Inventory; Trigwell, Prosser, and Ginns 2005)

CCSF scale	Factor loadings
3. In this course I try to develop a conversation with my students about the topics we are studying.	.76
6. I set aside some teaching time so that the students can discuss, among themselves, key concepts and ideas in this subject.	.76
8. I encourage students to restructure their existing knowledge in terms of the new way of thinking about the subject that they will develop.	.54
10. In teaching sessions for this subject, I deliberately provoke debate and discussion.	.71
17. I make available opportunities for students in this course to discuss their changing understanding of the subject.	.83
18. It is better for students in this course to generate their own notes rather than copy mine.	.58
23. I see teaching as helping students develop new ways of thinking in this subject.	.51
27. Teaching in this course should help students question their own understanding of the subject matter.	.43
28. Teaching in this course should support students to find their own learning resources.	.46
<i>Deleted items</i>	

(Continued)

CCSF scale	Factor loadings
3. In this course I try to develop a conversation with my students about the topics we are studying.	.76
6. I set aside some teaching time so that the students can discuss, among themselves, key concepts and ideas in this subject.	.76
8. I encourage students to restructure their existing knowledge in terms of the new way of thinking about the subject that they will develop.	.54
10. In teaching sessions for this subject, I deliberately provoke debate and discussion.	.71
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18. It is better for students in this course to generate their own notes rather than copy mine.	.58
23. I see teaching as helping students develop new ways of thinking in this subject.	.51
27. Teaching in this course should help students question their own understanding of the subject matter.	.43
28. Teaching in this course should support students to find their own learning resources.	.46
<i>Deleted items</i>	
2. It is important that the course is completely described in terms of specific objectives that relate to the assessment of the course.	.43
20. A lot of teaching time in this course should be used to question students' ideas.	.30
24. In teaching this subject it is important for me to monitor students' understanding of the subject matter.	.24
<i>ITTF scale</i>	
1. In this course students should focus their study on what I provide them.	.62
4. It is important to present a lot of facts to students so that they know what they have to learn for this subject.	.44
11. I structure my teaching in this subject to help students to pass the assessment of the course.	.45
13. I think it is important to give students a good set of notes in this course.	.64
14. In this course, I provide the students with the information they will need to pass the formal assessments.	.65
15. I should know the answers to any questions that students may put to me during this course.	.42
21. In this course my teaching focuses on the good presenting information to students.	.39
25. My teaching in this course focuses on delivering what I know to the students.	.64
<i>Deleted items</i>	
7. In this course I concentrate on covering the information that might be available from key texts and readings.	.25
29. I present material to enable students to build up an information base in this subject.	.34

Note. CCSF = the student-focused approach to teaching; ITTF = the teacher-focused approach to teaching.