

Professionalizing in and through research – Research studies and active learning promoting professional competences in Finnish teacher education

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Highlights:

- **Research studies promote student' professional learning in teacher education.**
- **Student teachers regard research studies as an important part of their education.**
- **Active learning experiences in teacher education reinforce the positive effect.**
- **The positive effect can be seen in all professional competences.**
- **Research studies should be integrated with other parts of teacher education.**

Abstract

The Key Note lecture presents how student teachers in Finnish teacher education programs benefit from authentic researcher experiences as part of their pre-service education. The data were collected by electronic questionnaires ($n = 287$) at two Finnish Universities. Teacher education programs guided student teachers to use and conduct research in the teaching profession. The results indicate that student teachers value research experiences. Research studies promoted professional competences and supported students' growth toward evidence-based practice and 21st century skills. Active learning experiences reinforced this positive effect. The implementation of research studies, quality of supervisors and integration with other studies were crucial.

1. Introduction

1.1. Teaching and learning for the future

All over the world, 21st century skills have become an urgent topic on the agenda of educational systems (e.g., Binkley et al., 2012). Rapidly updating knowledge and changing work life require that learners are ready to learn continuously. They have to understand how knowledge is created. Technology development, automation, and robotics will substitute simple works. Employees need higher order thinking. Scenarios of the future emphasize that workers need analytical and research-oriented skills and they must be able to inquire and assess the validity of knowledge and its different information sources. They also need competences for setting problems, arguing, and drawing conclusions (Binkley et al., 2012; Griffin, McGaw, & Care,

2012). Schools are required to seek new forms of teaching and learning for the future. Many discussions and documents propose how to face the future and delineate schools' and teachers' roles in these changing contexts (e.g., Bellanca, & Brandt, 2010; Griffin, McGaw, & Care, 2012; Scleicher, 2012; Shapiro, Lauritzen, & Irving, 2011). In international discussions, teachers are seen as key forces to move learning toward these goals (Darling-Hammond, 2010; Darling-Hammond & Lieberman 2012; Department of Education, 2012; Sherrill, 2011).

A key question is how teachers themselves learn analytical and critical thinking skills and how they achieve inquiry and knowledge-creation skills. The teaching profession is often described in terms of practical skills and competences, but discussions of 21st century skills require policymakers and teacher education institutions urgently to reflect on the teaching profession from a viewpoint of teachers as researchers. These questions touch deeply upon teachers' professional role. Are teachers more knowledge recipients than knowledge creators? How are they prepared for the role of knowledge creators in teacher education (TE)? How are inquiry skills with research orientation and knowledge creation integrated with teachers' other competences?

This article aims to reflect on the teacher's role as a knowledge creator. An important question is how teacher education (TE), particularly research studies on pre-service TE programs can lead teachers to a professional role where knowledge creation is an important part of their competence. After theoretical reflections, the article introduces how student teachers benefit from their experiences with research studies in Finnish TE programs. According to Finnish degree requirements, research studies consist of a theoretical basis for research work (e.g., reading and reviewing research literature and learning research methods) and conducting authentic research projects, as well as preparing and writing BA and MA theses. An important question is how these studies relate to student teachers' professional competences and active learning experiences.

1.2. Teachers as researchers and knowledge creators

The concept of teachers as researchers is one manifestation of teachers' role as knowledge creators. It has long roots in American teacher education history. Henson noted that the concept of classroom teachers as researchers existed as early as 1908 (Henson, 1996; Lowery, 1908); Henson expressed a tension that has been present since the beginning of the movement: "Even with encouragement to become involved with research, the type and level of involvement was limited throughout the first half of the twentieth century" (p. 54). In the 1980s and 1990s the movement of teachers as researchers was quite visible in TE discussions, and many researchers emphasized the importance of reflection and inquiry-based orientation in teachers' work (Elliot, 1990; Hargreaves, A. 1996, Hargreaves, D., 1996; Tabachnick & Zeichner, 1991). The inquiry-based orientation has had a close connection with an emphasis on critical reflection in teachers' work and the mission of making teachers critical thinkers. This paradigm constructs teachers as active knowledge creators. It also focused on crucial issues of social justice and inequalities in education (Liston & Zeichner, 1987).

Since the late 20th century, teachers as researchers has been an important paradigm for math teachers in particular (Breen, 2003; Crawford & Adler, 1996; Frade, Acioly-Régnier, & Jun, 2013), but language teachers see its value as well (Wang & Zhang, 2014; Xu, 2014). The ideology of teachers as researchers has expanded to many other subjects. However, still we can see the tension regarding who has right and obligation

to create knowledge (Lunenberg, Ponte, & Van de Ven, 2007). Henson (1996, p. 55) described levels in which participated teachers are involved in knowledge creation processes; they can be a “researcher,” a “junior partner,” or a “helper.” These categories reflect teachers’ degree of decision-making power throughout the research process and particularly with the identification of the problem, design of the study, and use of the data.

Most studies of the movement teachers as researchers are linked with teachers’ continuing professional development (CPD) and question how action research can activate teachers’ professional development (Dick, 2006). Elliot (2001) developed a theory and practice of action research in the contexts of curriculum and teacher development. He conducted a number of collaborative classroom research projects with teachers and schools. In addition, Hargreaves, D. (1996) and Stenhouse (1981;1983) have promoted the concept of teachers as researchers, even though they exhibited differences in their basic orientation; as Elliot (2001) concluded, “Whereas Hargreaves is primarily concerned with defining research as a ‘basis’ for practice, Stenhouse is primarily concerned with defining practice as a basis for research” (p. 572). Correspondingly, Cochran-Smith and Lytle (1999) argued for a new theory of knowledge for teachers. Despite some differences, all of these representatives saw that teachers need more opportunities to be real actors and partners in research in their classrooms. Educational literature provides several examples of how teachers develop their practice through their own research work or working on joint projects in which they combine their professional wisdom and research in local contexts (e.g., Borke, 2004; Dick, 2006; Issitt & Spence, 2005; Ragland, 2006). The message of these studies is that teachers’ own research work activates their professional development (Ballenger, 2009; Dick, 2006; Henderson, 2012).

A real research gap is that most studies of teachers as researchers and action research projects are linked with CPD, not pre-service time. In the last 10 years, AERA presentations of studies on pre-service TE with the teacher research component have been almost non-existent, but there are many examples of action and design-based research in schools after teachers graduate. Reasons for the phenomenon may be that in many countries TE is based mainly on BA degrees and professional competences are achieved through pedagogical post-graduate courses without a real research orientation. Preparing for research-based work in the teaching profession can also be undermined because of the pressure to provide new teachers with skills that are measured through students’ learning outcomes in high-stakes testing. However, 21st century skills and pressures to create knowledge in all professions demand reconsideration of how pre-service TE programs should consist of a research orientation for teachers’ work.

The European database Eurydice provides information on and analyses of European education systems and policies. Eurydice (2007) has gathered information from about 20 European nations. In several European countries, but not all, the research component is part of the initial TE. This varies from one compulsory methods course to a critical reading of research papers and the use of databases for policymaking recommendations. Finland makes a clear exception to the general trend, having approximately one-fifth of the five-year programs dedicated to research studies (Niemi & Jakku-Sihvonen, 2006; Sahlberg 2012). In the United States, a common

picture is even more diffuse because of TE programs' heterogeneity in terms of the length, level of degree, and quality.

The need for a research orientation is recognized in some American TE programs. Bailey and Van Harken (2012, p. 241) wrote:

As aspiring professionals, pre-service teachers must become good consumers of educational research as well as competent researchers who can use tools of inquiry to improve their practice and conduct their own educational research in the future. For this reason, many master's programs in teacher education traditionally require a research component along with the pedagogical training offered to pre-service teachers. however, pre-service teachers enrolled in research methods courses often regard unfamiliar concepts and demanding pace of these classes as stumbling blocks in their teacher preparation programs.

It seems that in pre-service TE there is a significant need to have more research focused on how to prepare new teachers for a research-oriented profession (Cornelissen & Van der Berg, 2014; Hall, 2009; Feindt & Broszio, 2008; Elliot, 1990).

1.3. Teachers and evidence-based policy and practice

In addition to 21st century skills, another reason teachers' role as knowledge creators and researchers has become an actual topic is the concept of evidence-based policy and practice. Decisions should be based on the best available knowledge. This raises the question of who owns and produces this knowledge. We have many national and international databases (e.g., Organisation for Economic Co-operation and Development [OECD], 2013), and decision makers can implement various methods of providing evidence. Many critical voices (Berliner, 2002; McCormick, 2003; Ozga, 2000), however, warn that evidence cannot come only from outside the professional field. Berliner (2002) and McCormick (2003) remarked that educational research is the hardest science of all when striving for research- and evidence-based policy and practice because of the enormous complexity of educational phenomena. Evidence has many sources. It can be based on scientific research knowledge. However, evidence can also grow from the observations and experiences of experts and practitioners (e.g., Issitt & Spence, 2005). There are many voices emphasizing that teachers should also play an important role when creating evidence. Therefore teachers should have basic competences for systematic inquiry and knowledge processes so that they can analyze their work and students' learning like researchers.

How are teachers prepared for this kind of role, in which they are active partners in research projects or conduct research-based activities on their own? Levin (2004) remarked:

Very few organizations have the capacity be involved actively in research partnerships or to make extensive use of the results. Efforts to increase teacher research or action research run into problems of time and research background among teachers. Many user organizations—for example, schools, adult learning organizations or individual employers—are small and lack with training or skill in research. (p. 10)

Schuller et al. (2006, p. 60) confirmed "...capacity building refers also to policy makers' and practitioners' capacities to understand and use research, including the proper articulation of researchable issues." He also asked how much research is embedded in teacher training. No one can be a researcher without training. Becoming a teacher researcher is a long learning process that should start in the beginning of teacher education.

1.4. Research capacity as part of a teacher' professional role

Scardamalia and Bereiter (2003) described progressive problem solvers as experts who, rather than reducing problems to previously learned routines, are open to new questions and different kinds of evidence. Teachers' professional role has been a contradictory topic in educational discussions. Is teaching and teachers' work more a craft in which teachers are expected to follow "teacher-proof" curricula and standards that authorities have defined in detail, or are teachers open to exploring new questions? Many researchers (e.g., Darling-Hammond, 2010; Hargreaves, 1994; Hargreaves, 2000; Oser, 1994; Schön, 1991; Tabachnick & Ziechner, 1991) emphasize a broad view of teachers' professional role in schools and society as a whole. In addition, the European Union has given recommendations for basic principles of teaching and teachers' work and emphasized teachers role as knowledge creators (Commission of the European Communities, 2007, p. 14):

...Furthermore, as with members of any other profession, teachers have a responsibility to develop new knowledge about education and training. In a context of autonomous lifelong learning, their professional development implies that teachers:

- continue to reflect on their practice in a systematic way;
- undertake classroom-based research;
- incorporate into their teaching the results of classroom and academic research;
- evaluate the effectiveness of their teaching strategies and amend them accordingly; and
- assess their own training needs.

Accordingly, the capacity for research is part of teachers' responsibilities, and it creates a basis for reflective practice. Henderson (2012, pp. 1–2) argued:

Teachers who are researchers think of themselves as knowledge creators, a stance in stark contrast with teachers simply being receivers of knowledge. Teachers' views of themselves as capable of generating knowledge about children and learning and the practice of teaching enhance their identity as professionals.

She also referred to Rinaldi's "cultured" teachers (Rinaldi, 2005, p. 73): "A cultured teacher not only has a multidisciplinary background, but possesses the culture of research, of curiosity, of working in a group: the culture of project-based thinking."

The same kind of experience comes from Finland. Jyrhämä and Maaranen (2012) analyzed teachers' and student teachers' concepts of and feedback on research studies in Finland. They concluded that research studies are valued; they stated (p. 110): "Based on our results, it seems that teachers' inquiry-orientation is first and foremost an attitude towards one's work. The focus is on the development of one's self as well as the development of the school community." They also found that through research

studies, teachers learn alternative ways of working, reflecting, dialoguing, and gaining feedback for their work.

If teachers are seen as knowledge creators and researchers, it does not mean that they have weaker practical skills. Teachers' research work can be complementary and reinforce their practical skills and also strengthen their identity as reflecting practitioners who develop their profession and their own work. Very often a research orientation leads to collaboration and sharing, which are key elements in the teaching profession (Darling-Hammond, & Lieberman, 2012).

1.5. Preparing teachers to be knowledge creators requires active learning

If teachers are prepared for a profession that is research-oriented and in which practitioners create evidence for developing teaching and learning, it raises the question of what is the quality of research studies. Research studies in TE have a special function that goes beyond the traditional measures of research work. In addition to having the ability for inquiry and knowledge creation, the teacher as a researcher must have an understanding of how to use research as a tool for developing teaching and learning. Having the capacity to use, interpret and conduct research is part of teachers' professional role. It sets high demands for TE programs to provide authentic learning experiences that connect knowledge creation and teachers' professional role. It requires methods that are typical for active learning, including student-centered approaches.

The recent constructivist learning theories emphasize learners' active contribution and self-regulative processes. Active learners have a high level of inquiry skills, and they construct their knowledge base by continuously learning, reflecting on, and controlling their own learning processes (e.g., Pintrich & McKeachie, 2000). We have increasing evidence that the active process is both individual and also based on sharing and participation with different partners in a community (Nonaka & Takeuchi, 1995; Scardamalia, 2002; Sfard, 1998; Slavin, 1997). Knowledge is not an individual possession, but rather socially shared and emerges from participation in sociocultural activities. The goals of learning include the learner being able to elaborate on applications of knowledge and potentially produce new knowledge individually and collaboratively. These principles create also frameworks for a teaching and learning in TE programs. Furthermore, they concern research studies as a part of professional learning in pre-service TE.

2. The main principles of Finnish teacher education

The Finnish education system has received global attention because of the great success of Finnish 15 year olds in the OECD's Program for International Students Assessment [PISA] surveys in 2000, 2003, 2006, and 2009 (e.g., OECD, 2010). The knowledge and skills of Finns in problem-solving, scientific, mathematical, and reading literacy are representative of the highest level of international standards. According to many researchers (e.g., Niemi, Toom, & Kallioniemi 2012; Darling-Hammond, 2010; Schleicher, 2005), success in education is a result of many political decisions. One of those decisions has been that TE was transferred to universities, all TE, including for primary school teachers, was raised to the MA level (five-year programs) in the late 1970s, and all teachers must internalize a broad professional role

in which a research capacity is an important element (Niemi & Jakku-Sihvonen, 2006; Kansanen, 2006).

Finnish teacher education programs have a strong research component (Niemi & Jakku-Sihvonen, 2006; Jyrhämä et al., 2008; Kansanen, 2006). The leading principle has been that teachers need profound knowledge of the most recent advances of research in the subjects they teach. In addition, they need to be familiar with the latest research on how something can be taught and learned. The aim is for teachers to internalize a research-oriented attitude toward their work. This means that teachers learn to take an analytical and open-minded approach to their work and that they develop teaching and learning environments in a systematic way.

The Finnish TE for both primary and secondary school teachers consist of a five-year MA program (including a BA degree) with 300 European Credit Transfer System [ECTS] credits; 1 ECTS credit corresponds to about 28 hours of students' work, including contact hours and independent study. In this article, student teachers aiming to become primary school teachers are called *primary student teachers*, while student teachers aiming to become secondary school teachers are referred to as *secondary student teachers*. Primary school teachers teach one class at elementary grade levels 1–6, and secondary school teachers teach one or two subjects in several classes at lower (grades 7-9) and upper secondary schools (three-year high schools). TE programs for both student groups have almost the same structure, but they differ in terms of majors and minors. The programs consist of the following elements (Author & Jakku-Sihvonen, 2006):

- *Major studies* (approximately 30% of the MA program). Primary school teacher programs: Major in educational sciences including educational foundations, psychological, sociological, and cultural knowledge for teachers' work, including a BA and MA thesis involving research methodological studies. Secondary school teacher programs: Major in one school subject with its foundations and research studies for the BA and MA thesis in their major.
- *Pedagogical studies* (approximately 20% of the MA program). Guidance to teach different subjects consisting of teaching practice and research-based orientations in the teaching profession.
- *Minor studies* (approximately 20% of the MA program). Primary school teacher programs: Multidisciplinary studies give a prominent knowledge base to a class teacher in all primary school subjects, as well as the cross-curricular themes to be implemented in various school subjects. Secondary school teacher programs: Some school subject other than their major.
- *Additional minors* (approximately 10–20% of the MA program). These consist of studies in subject disciplines with the aim of qualifying to teach them or school-related optional studies.
- *Communication and ICT studies* providing generic skills and *optional studies* depending on students' personal interests (approximately 10–12% of the MA program).

Research studies demand that student teachers formulate a problem, seek information and data for it, elaborate on it with the latest research, and make a synthesis in the form of a written thesis. An important objective is to promote independent thinking and the capacity to analyze pedagogical phenomena as professionals. Other general aims are that all professionals should inquire into and use evidence in their profession

and develop critical scientific literacy, an understanding of knowledge-creation processes, and the ability to analyze the validity of knowledge sources. A leading principle is that an authentic experience of the research process promotes an understanding of the relationship between a theoretical knowledge base and practice and makes it possible for teachers to develop as reflective practitioners in their work. Research studies include various courses of research methods and independent research for BA and MA theses under supervision.

Primary school student teachers' BA and MA theses focus on teaching and learning in classrooms, curriculum issues, teachers' professional development, or very general education questions in society such as environmental protection, equity, technology, or children's welfare protection. They can connect their theme directly to classrooms and schools as an action research project, but this is not compulsory. Theses can also focus on meta-knowledge of scientific research on teaching and learning and education in general. Quite often, student teachers have the freedom to choose a theme that is interesting to them personally, but nowadays, there are also more options to join larger research groups and research teams. An important aim is for the student class teachers to internalize a research-oriented attitude in their work.

Secondary student teachers carry out their master's thesis (40 ECTS credits) in their subjects. For their master's thesis, they can choose either a pedagogical orientation or a subject orientation and prepare the thesis under the guidance of a professor or in a research group. Subject departments are responsible for BA and MA research seminars. In their pedagogical studies, student subject teachers also have a research component with research methodological studies that familiarize them with school pedagogy themes.

Professors and supervisors in Finnish TE have the responsibility to guide students in the research-oriented aspects of their education. Students must learn to read educational research reports, inquire into and analyze data, and draw conclusions. Research methods may vary from historical analysis to surveys and experiments. The main object of these studies is not the completion of the BA and MA theses themselves, but actually to further the process by which students come to see themselves as active studying and working agents. The aim of the guiding process is to help students to discover and tap into their own intellectual resources and to make them better able to utilize the resources of the study group with which they work.

3. Methodology

The data was collected by the electronic questionnaire consisted of questions on subjects' demographic background and three instruments: Professional Competences Instrument, Research Studies Instrument, Active Learning Experiences Instrument, as well as open-ended questions. **The Professional Competences Instrument** is based on a concept consisting of a broad view of teachers' professional role in schools and society as a whole. It consisted of 40 items representing the following five dimensions of professional competences: (1) designing own instruction, (2) cooperation—teachers working with others, (3) ethical commitments in the teaching profession, (4) diversity of pupils and preparing them for the future, and (5) teachers' own professional learning and growth. Student teachers were asked to assess how well their TE program readied them for their future teaching profession by applying the following scale: 1 = very weakly, 2 = weakly, 3 = fairly, 4 = well, and 5 = very well.

The Research Studies Instrument consisted of 20 items representing two subscales: Critical Research Literacy and Research for Profession. Based on their own experience, students were asked to assess how research studies had promoted the development of their research abilities and qualities for teachers' work and the teaching profession using the following scale: 1 = very little, 2 = little, 3 = somewhat, 4 = much, and 5 = very much. There was also an option 0 = I have not yet completed research studies; the students who answered in this way ($n = 51$) have been subtracted from the results. After the structured questions, students were asked to answer an open-ended question: What else would you like to say about research studies? **The Active Learning Experiences Instrument** is based on theories that consider learning a constructivist, self-regulative, and collaborative processes. It consisted of 20 items comprising one scale. The items described active learning experiences according to the following themes: independent inquiry, structuring and restructuring of knowledge, problem-solving, critical orientation in studies, and the evaluation of knowledge. The student teachers were asked to assess their active learning experiences in terms of how often in their TE studies they had had these experiences by applying the following scale: 1 = almost never, 2 = once or twice in a year, 3 = about once in a month, 4 = about once in a week, and 5 = nearly daily. After completing the 20 items of the Active Learning Instrument, student teachers were asked to describe what had been their best experiences in active learning.

4. Findings

4.1. What had student teachers learned in research studies?

The general picture of learning in research studies was quite positive. All variables describing skills in *Critical Research Literature* had a mean > 3 (Table 1). Student teachers scored high on their readiness to inquire ($M = 3.8$), independent thinking ($M = 3.7$) and understanding research literature ($M = 3.7$). Furthermore, they scored high on being critical of knowledge and phenomena ($M = 3.6$) and critical thinking ($M = 3.6$). By giving student teachers experience on reading, analyzing and interpreting scientific literature and conducting own research projects, research studies developed their abilities and readiness to engage in scientific research and critical thinking. Students gave slightly lower scores on how research studies had supported them to develop skills for the variable *Research in Profession* (means from 3.6 to 2.9). However, student teachers reported that they had achieved the ability to see the teaching profession as a continuous development task ($M = 3.6$) and learned to understand the significance of research in classrooms and schools ($M = 3.5$).

A one-way ANOVA was used to test the differences between the two teacher student groups: primary and secondary student teachers (Table 1). No significant differences between the two student teacher groups were found in terms of *Critical Research Literacy*. However, in *Research for Profession*, primary student teachers ($M = 3.3$) scored higher than secondary student teachers ($M = 3.0$), and the difference between the two groups was significant ($F [1, 266] = 8.33, p = .004$). A closer examination of the differences in *Research for Profession* revealed that primary student teachers scored higher on the variable of *Considering Teaching Profession as a Continuous Development Task* ($M = 3.69$) and on *Considering Working as a Teacher as Continuous Growth* ($M = 3.47$) than secondary student teachers ($M = 3.17, M = 3.02$, respectively). The results indicate that primary TE programs have succeeded better to

conduct research studies in such a way that they promote student teachers' growth as a researcher in teaching profession

Table 1. Means and standard deviations of two student teacher groups scoring on the Research Studies, ANOVA. Scale: Research studies have promoted research skills for teaching profession 1 = very little ... 5 = very much.

The sum-variables and their items	Student groups				Total group		F-value	P
	Primary		Secondary		M	SD		
	M	SD	M	SD				
Critical Research Literacy	3.5	0.7	3.5	0.8	3.5	0.8	0.1	n.s.
1. Development of readiness for inquiry	3.8	0.8	3.8	1.0	3.8	0.9	0.2	n.s.
2. Development of independent thinking	3.7	0.8	3.3	1.0	3.7	0.9	0.1	n.s.
3. Understanding research literature	3.7	0.9	3.6	1.0	3.7	1.0	0.4	n.s.
4. Questioning knowledge and phenomena	3.6	0.9	3.5	1.0	3.6	1.0	0.4	n.s.
5. Development of critical thinking	3.6	1.0	3.5	1.1	3.6	1.0	0.4	n.s.
6. Development of methods for knowledge creation	3.4	1.0	3.5	1.0	3.5	1.0	1.3	n.s.
7. Conscientiousness of error sources of research	3.4	1.0	3.4	1.1	3.4	1.0	0.1	n.s.
8. Applying research knowledge into practice	3.2	1.0	3.1	1.1	3.1	1.1	0.6	n.s.
Research for Profession	3.3	0.9	3.0	0.9	3.1	0.9	8.3	.004
9. Considering teaching profession as continuous developmental task	3.6	1.0	3.2	1.2	3.4	1.1	11.6	.001
10. Considering working as a teacher as a continuous growth	3.5	1.2	3.0	1.2	3.3	1.2	10.4	.001
11. Becoming conscious of societal significance of teaching profession	3.3	1.1	3.0	1.1	3.2	1.1	5.9	.016
12. Increasing societal consciousness	3.3	1.0	3.0	1.1	3.1	1.1	3.9	.048
13. Understanding significance of research at classrooms and schools	3.5	1.0	2.9	1.2	3.2	1.1	24.2	.000
14. Development of my own personality	3.2	1.2	3.2	1.2	3.2	1.1	0.0	.882
15. Increasing responsibility in teaching profession	3.2	1.2	3.0	1.2	3.1	1.2	2.5	.112
16. Understanding students' learning processes	3.2	1.1	3.0	1.1	3.1	1.1	3.2	.076
17. Increasing a teacher's ethical responsibility	3.2	1.1	2.7	1.1	3.0	1.5	12.3	.001
18. Research based development of school	3.2	1.0	2.6	1.1	2.9	1.1	19.7	.000
19. Clarification of significance of a teacher's work	3.0	1.1	2.7	1.1	2.9	1.1	4.7	.031
20. Development of educational responsibility	3.0	1.1	2.7	1.1	2.9	1.4	7.4	.007

4.2. How do research studies and active learning predict professional competences?

The study investigated also how research studies predict achievements in professional competences and what kinds of relationship can be found between research studies, active learning, and professional competences in TE.

There were strong positive correlations between the sum variables of research studies, active learning, and professional competences, indicating that student teachers with positive experiences in research studies and more elements of active learning in their studies also reported an increase in their professional competences.

Next, we were interested in how research studies and active learning predict student teachers' growth in professional competences. The regression analysis results are presented in Table 2.

Table 2. Summary of regression analyses

Criterion variable	Explanatory variable	B	SEB	beta	R ²
P1	Critical Research Literacy	.24	.06	.30	.18
	Research for Profession	-.02	.05	-.03	
	Active Learning	-.20	.05	.24	
P2	Critical Research Literacy	.02	.06	.03	.15
	Research for Profession	.12	.05	-.18	
	Active Learning	.22	.05	.27	
P3	Critical Research Literacy	.08	.06	.09	.33
	Research for Profession	.23	.05	.32	
	Active Learning	.27	.05	.31	
P4	Critical Research Literacy	.12	.07	.13	.25
	Research for Profession	.18	.06	.22	
	Active Learning	.28	.06	.29	
P5	Critical Research Literacy	.22	.06	.24	.39
	Research for Profession	.12	.05	.16	
	Active Learning	.37	.05	.40	

P1=Designing own instruction

P2 = Cooperation—teachers working with others

P3 = Ethical commitments in the teaching profession

P4 = Diversity of pupils and preparing them for the future

P5 = Teachers' own professional learning

As a summary of the regression analysis, we may conclude that research studies in TE have clear predictive value in terms of student teachers' professional competences, and have a particular effect on their own professional learning. However, the effects are much higher if students also have active learning experiences in their studies. We can conclude that research studies and active learning reinforce each other and together facilitate students' growth in professional competences.

4.3. How do different student teachers assess the relevance of research studies?

We wanted also to investigate the kinds of profiles among students when research studies, active learning, and professional competences are included in the same analysis. There were 217 students who responded to all eight dimensions. Students were classified using a grouping that minimizes distances from their own cluster center and maximizes distances from other cluster means. The criteria were for groups to differ statistically and the ability to interpret group profiles in a meaningful way. Students were classified using 2–5 groupings with iterations. The best solution comprised four clusters.

Table 3. Cluster centers of the four-cluster solution

	Cluster 1 (<i>n</i> =91)	Cluster 2 (<i>n</i> =42)	Cluster 3 (<i>n</i> =35)	Cluster 4 (<i>n</i> =48)
1. Designing own instruction	3.5	2.8	3.7	4.0
2. Cooperation—teachers working with others	2.3	1.8	2.4	2.9
3. Ethical commitments in teaching profession	3.2	2.5	3.2	3.9
4. Diversity of pupils and preparing them for the future	2.8	2.1	3.0	3.7
5. Teachers' own professional learning	2.9	2.1	3.0	3.8
6. Active Learning	3.1	2.6	3.1	3.9
7. Critical Research Literacy	3.7	2.9	2.9	4.2
8. Research for Profession	3.4	2.6	2.0	4.0

ANOVA: All clusters differed statistically significantly (.001).

Table 4. Distribution of primary and secondary school student teachers in clusters of professional competencies, research studies, and active learning experiences

	Cluster 1	Cluster 2	Cluster 3	Cluster 4
Primary student teachers	72% (66)	45% (19)	54% (19)	56% (27)
Secondary student teachers	28% (26)	54% (23)	45% (16)	44% (21)
Total	100% (91)	100% (42)	100% (35)	100% (48)

Cluster 1 = Good professional competencies with good research skills

Cluster 2 = Low professional competencies with low research skills

Cluster 3 = Good professional competencies with intermediate critical research skills and low research skills for profession

Cluster 4 = Excellent professional competencies and excellent research skills with many active learning experiences

The number of cases in each cluster is shown in Table 3. Primary and secondary school student teachers' proportions in each group were also counted (Table 4). The groups were labeled according to features that were typical of the group.

After the structured questions on the research studies, the following open-ended question was posed: What else do you want to say about research studies? The open

question was quite general, and in future studies it must be more specific and ask for more arguments. However, the 131 comments provided gave additional information about research studies and can be used to understand students' needs. The following descriptions illustrate typical responses in different clusters.

4.3.1. High value of research studies—high professional competences

Students in the largest group ($n = 91$) had high levels of professional competences and saw critical research literacy as quite important; they also valued research for their profession. They had an average level of active learning experiences. In this cluster, most students were primary student teachers.

The main message of this group's open-ended responses was that research studies are important, but they must not take a leading role in TE at the expense of other studies and they should be integrated within the teaching profession.

"It would be more essential that in the research course we could get to know what educational research is, in some extent learn research methods that may differ from other disciplines, but focus on it how a teacher can apply and evaluate critically educational scientific studies. It would be also important how a teacher can research his/her own work and develop it." (75)

The open-ended responses emphasized the quality of guidance and supervision. The students stressed the importance of clear objectives, well-communicated working methods, and comprehensive support for their research from research supervisors. They criticized incompetent supervisors who did not have a clear idea of research studies, as well as the timing of studies that require more thought. Respondents in this group made the following comments:

"Topic interesting. Teachers/supervisors have been incompetent, at least in my case. It is difficult if a student does not know what should be done." (178)

"The course should be implemented in another way." (45)

4.3.2. Excellent value of research studies—excellent professional competences

The second-largest group ($n = 48$) exhibited excellent experiences related to research studies; they also had quite high levels of professional competences and extensive active learning experiences in their TE. In this group, there was a small majority of primary student teachers.

The main message of this group's responses was that these studies are really needed for the teaching profession and they are an important part of TE. The following quotations summarize many of the elements that make research studies relevant for student teachers:

"It is a sum of many small factors, e.g. a theme was the freedom to select a topic in a reasonable range, and I found a topic in which I really became interested, a theme of my research thesis was really linked with my career choice, learning and teaching (unlike my pure Math subject matter research), a supervisor who was able to give me freedom and advices, demand and give space and certainly a peer researcher with whom cooperation went unbelievable easily (smoothly) and without problems." (50)

“I feel that research studies are the important part of my TE. On the one hand learning to know research literature and on the other hand following classes and schools on the spot have brought a connection with theory and practice. I see this as an important discovery in TE. I believe that research studies also support to shape my own thinking of educational philosophy” (571)

4.3.3. Low value of research—low professional competences

The third-largest group ($n = 42$) exhibited the lowest-level values in professional competences and few active learning experiences; moreover, they did not see relevance of the research studies, particularly research for their profession.

The main message of this group’s responses was there were too many research studies and they were separate from other studies; these student teachers emphasized that teaching is quite practical and they enjoy practice and would like to learn more in this vein. Respondents in this group made the following comments:

“It feels like a tease that basics of research work are still taught separately in pedagogical studies. These studies should introduce recent research. To do own study is too much.” (78)

“I would hope that more lesson hours would be transferred from research studies to pedagogical subject matter pedagogy.” (238)

4.3.4. Intermediate value of general research but low value of research for profession capacity—good professional competences

The smallest group ($n = 35$) was slightly contradictory. Members in this group had high levels of competences, and intermediate active learning, but they did not have good experiences related to research studies and had the lowest values in *Research for Profession*.

The main message of this group’s responses was that research studies took too much time and work for student teachers and that they would like to have better supervisors for research studies. One respondent in this group made the following comment:

“Research studies are useful for developing one’s own thinking. However, in my case it happened that supervision was incompetent, which certainly decreases one’s engagement with research. To get deeply in touch with a topic, good supervision is required.” (43)

5. Discussion

5.1. Research studies are highly valued

Discussions of 21st century skills require schools and teachers to promote skills that help students to become knowledge creators and critical thinkers (e.g., Bellanca & Brandt, 2010; Griffin, McGaw, & Care, 2012; Shapiro, Lauritzen, & Irving, 2011). Based on the findings of the current study, we may conclude that student teachers learn critical thinking, independent inquiry, and many other skills that are necessary in knowledge creation that can be taught through research studies in TE. Student teachers regarded these studies as important from the viewpoints of general scientific inquiry, of the teaching profession, and of their own professional development. This supports the paradigm that teachers’ own research processes are important for their professional development. These kinds of experiences have been frequently reported in studies that were implemented after graduation among many teacher groups, like math teachers (Breen, 2003; Crawford & Adler, 1996; Frade, Acioly-Régnier, & Jun,

2013) and also language teachers (Wang & Zhang, 2014; Xu, 2014).). Cochran-Smith and Lytle (1999), Elliot (1991), and Dick (2006) have presented the same idea for several decades. In our study, we found that research studies consisting of theoretical basis of research work (e.g. reading and reviewing research literature, learning research methods) and promoting to conduct own authentic research projects linked with writing their BA and MA thesis had an effect on student teachers' professional development, particularly on their ethical commitment and concept of their own professional learning. Research studies also affected students' ability to deal with learners' differences and collaborate with different partners in educational questions, and even helped them in their everyday classroom teaching. This study provides evidence that research studies in TE can prepare teachers for the role they are expected to fulfill when promoting 21st century skills and simultaneously bring additional value to teachers' professional duties in schools and classrooms.

5.2. Evidence-based practice require research orientation

Teachers work in changing environments. What was valid in the past is neither relevant today or in the future. Evidence-based policy and practice (Levin, 2004; Schuller et al., 2006) requires administrators, teacher educators and practitioners to make decisions and conclusions based the best available knowledge. Ownership of the knowledge in their profession means that also teachers as practitioners need to have the capacity to use research and also to provide evidence through research (Henderson, 2012; Sherrill, 2011). How can teachers be researchers if they do not have experiences with research in their pre-service time? The teacher's role as an evidence practitioner will be minimal if they do not have the ability to use tools, such as inquiry, questioning and critical thinking that are fundamental to research work. In the Finnish TE system, these aims have been integrated within the teacher's professional role. Student teachers' authentic experiences of being a researcher strengthen their wide and comprehensive role as a teacher. But we can see that research studies must be integrated with other parts of teacher education. Student teachers' comments show that becoming a teacher who creates knowledge to improve a school is a holistic process and requires support from competent supervisors as well as a TE curriculum design that connects and integrates different studies with each other.

5.3. Research studies and active learning—teacher education culture

Updated knowledge and teachers' changing role require that teachers have the capacity to independent and also collaborative inquiry. These qualities are typical for active learning (Niemi, 2002; Scardamalia, 2002; Scardamalia & Bereiter, 2003). In this study, we can see that research studies had a much stronger influence on student teachers' professional competences if they also had active learning experiences. Research studies and active learning together predicted 33% of teachers' concept of their own professional development and 25% of ethical thinking in the teaching profession; in all competence areas, active learning brought additional predictive value. The Niemi (2002, 2012) has proposed that TE culture should provide more active learning experiences to prepare teachers to use these methods with their students in schools. When aiming at 21st-century skills, an active learning culture is more important than ever (Griffin et al., 2012).

4.4. The quality of research studies is important

Finnish TE has attracted a lot of attention because of students' high learning outcomes (Niemi et al., 2012; Darling-Hammond, 2010; Darling-Hammond & Lieberman, 2012). In many international discussions and conferences, the authors of this study have been asked if the five-year MA degree explains students' high learning outcomes in Finland.

In light of this study, it is not only a question of the length of TE. What is equally important is how the studies have been constructed and implemented. Research studies promote students' professional learning in teacher education, and student teachers regard research studies as an important part of their education. Active learning experiences in teacher education reinforce the research studies' positive effect on professional competences. Student teachers' professional competences were much higher when both research studies and active learning experiences supported them.

In our qualitative analysis, we received suggestions on how to increase the quality of these studies. Some comments concerned practical elements of research studies such as timing and credits. Others were more linked with pedagogy, focusing on how to integrate research studies with other elements of TE, particularly with academic subject studies and classroom practices. Open-ended comments confirmed how important it is for students to have authentic experiences with research studies as part of their own professional learning. They need freedom and support. The role of a research supervisor is crucial as s/he must understand teachers' professional development, make studies pedagogically meaningful, and clarify the objectives and criteria of these studies. This supports findings that have been done in other countries as well (Cornelissen & Van der Berg, 2014)

5.5. Conclusions

Teachers' role is changing radically. Knowledge is continuously being updated, and it is ever changing. In addition, contexts where teachers are working are different than those they once learned. Students are also increasingly heterogeneous, and their needs for support are expanding. Thus, teachers should internalize the attitude of thinking like a researcher, constantly trying to find new solutions and seeking new evidence to improve their work as professional experts. Working as research and evidence-based practitioners requires that they have a capacity to use research knowledge and tools to observe and produce evidence in their own work and know how to draw conclusions. This demands understanding how knowledge is created in their own professional area, and they must also have a capacity for critical questioning and thinking. Without these skills, it is difficult for teachers to teach 21st century skills. Research studies are not the only component of teacher education, but they can serve as a pathway to deepen professional learning and 21st century skills. At this moment, there is a significant need for more research on how to implement research studies in such a way that these important aims of the teaching profession can be achieved.

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