Finnish teacher education and its contributions to pre-service teachers' instructional self-efficacy

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This study focuses on how Finnish pre-service teachers' instructional self-efficacy contributes to their belief in their ability to provide learning opportunities and positive classroom outcomes. Data were gathered from 153 pre-service teachers and analysed using structural equation modelling. We found that experiences with problem behaviour negatively contributed to pre-service teachers' instructional self-efficacy. We also found two factors that contributed positively to pre-service teachers' instructional self-efficacy: supervisor's feedback and perceived practical examples in general pedagogy courses.

Introduction

The *Programme for International Student Assessment* (PISA) conducted by the Organisation for Economic Co-operation and Development (OECD, n.d.) and the accompanying 'league tables' has undoubtedly put Finnish schools and teachers on the political agenda. Finland is, by many, perceived as winners, while other countries are perceived as losers in the international comparisons. This article focuses on Finnish teacher education as an interesting case which emerges from the PISA study results. More specifically, this study focuses on how Finnish pre-service teachers' instructional self-efficacy contributes to their belief in their ability to provide learning opportunities and positive classroom outcomes.

Teacher education is a complex national program that involves earning a degree in an academic subject (such as mathematics, chemistry, physics, etc.) and completing a pedagogic training, which, in a more direct sense, prepares the pre-service teacher for professional life within the school context (Darling-Hammond & Lieberman, 2012).

The goal of teacher education in Finland is to ensure graduating teachers are ready to work independently as teachers, educators, and counsellors. Typically, Finnish subject teachers (grades 7–9 in lower secondary school and grades 1–3 in upper secondary school) pursue a master's degree in their teaching subject. For example, physics teachers study for a total of approximately five years: three years pursuing physics, one year pursuing a minor subject (e.g. mathematics), and one year pursuing teacher education (60 ECTS in total). Thus, teacher education spans several university departments. Each applicant must complete an aptitude test, and for most subjects, there are many more applicants than placements in teacher-education programs. However, in science-focused teacher

education programs, there can be fewer applicants than placements. Still, not necessarily all applicants are accepted into science teacher education due to their evaluated aptitude. Finally, there are several periods at which individuals join subject-focused teacher education programs: while entering university, during university studies, and after pursuing a master's degree.

Therefore, the students of Finnish teacher education programs have diverse backgrounds in pedagogical education. During their pedagogical education with an educational sciences faculty, subject pre-service teachers complete approximately 40 ECTS in general education and pedagogical content knowledge, including a small thesis, pedagogy in a subject (pedagogical content knowledge), and 20 ECTS in guided teaching practice in their field in a teacher training school or a city school (Lavonen & Juuti, 2012). Class teachers (grades 1–6) must also earn a master's degree. In class teacher programs, pre-service teachers major in education and complete 60 ECTS in multidisciplinary studies that can be characterised as subject didactics, or pedagogical content knowledge in all school subjects. For example, a class teacher may complete 20 ECTS in teaching practice, 7 ECTS in mathematics didactics, and a selection of minor subjects based on their interests. Many pre-service teachers choose to complete 60 ECTS in a specific subject (e.g. history or mathematics) and acquire their subject teacher qualification as well. Class teacher education programs are very popular; in fact, universities are able to accommodate only 10% of applicants.

Teachers in Finland are trusted, and they have rather significant pedagogical autonomy to design their classes, select learning materials, and conduct pupil assessments (Niemi, 2012). Finnish teachers act independently as teachers, educators, and supervisors. Similarly, universities have the academic freedom to organise programs, and the university degree on its own qualifies graduates to teach; no additional certification from an external authority is needed. However, national-level coordination exists between teacher education units and the Ministry of Education and Culture.

Teachers must master a number of skills to manage their daily classroom work (Darling-Hammond, 2006a). However, some skills seem to be more vital than others in carrying out good teaching practices. Among these skills, teachers' self-efficacy is considered to be a key issue (Bandura, 1997; Skaalvik & Skaalvik, 2007, 2010; Woolfolk, Rockoff & Hoy, 1990). Teacher self-efficacy refers to pre-service teachers' belief in their ability to carry out good teaching practices in the classroom and the need within teacher education to foster such belief in pre-service teachers. In Finland, classroom management is typically taught implicitly in general pedagogy, subject pedagogy, and teaching practice. Consequently, in this article, we focus on how pre-service teachers' teacher education experiences contribute to their instructional self-efficacy with respect to managing classrooms and engaging pupils in learning. Teaching is a particularly complex profession in which many sub-skills are required and in which instructional self-efficacy with respect to mastering the variety of complex situations in the classroom and, more generally, in the school, is needed for successful teaching. Thus, successful experiences in teaching practice are important to satisfy pre-service teachers' need for appraisal in their work.

Based on this premise, we set out to answer the following research question: In what ways do pre-service teachers' teacher education experiences contribute to their instructional self-efficacy?

Our empirical data come from a survey of 153 pre-service teachers in class teacher and subject teacher education programs in Finland. In the following section, we review the previous research of pre-service teachers' instructional self-efficacy and explain the theoretical rationale for our empirical model. Further, we develop hypotheses that are tested against empirical data.

Theoretical framework

Previous research

There has been extensive research on different aspects of teacher self-efficacy (Gibson & Dembro, 1984; Hoy & Woolfolk, 1993; Klassen, Tze & Betts, 2010; Tschannen-Moran & Woolfolk Hoy, 2001, 2007) and pre-service teachers' sense of self-efficacy in teaching (Hebert, Lee & Williamson, 1998; Liaw, 2009; Lin & Gorrell, 2001; Woolfolk & Hoy, 1990).

The act of teaching involves competencies such as knowledge; communicative, social, and cooperative skills; leadership; administrative skills, such as planning and multitasking; and continual personal and professional development (Dale, 1999; Darling-Hammond, 2006a, 2006b). To ensure that teachers meet these professional requirements, teacher education must provide knowledge and skills to support pre-service teachers in mastering these competencies in order to support the development of effective teachers (Skaalvik & Skaalvik, 2010). Effective teachers must not only gain these individual competences but also adequately integrate them in their work. Teachers must see themselves as capable of carrying out the necessary professional actions and achieving their professional goals in a wide variety of situations; in other words, they must believe in themselves. Thus, self-efficacy is considered a key factor in organising teachers' (or any individual's) attempts to perform tasks (Bandura, 1997).

Bandura proposed that there are four major influences on a pre-service teacher's instructional self-efficacy: mastery experiences, verbal persuasion, vicarious experiences, and physiological arousal. The most powerful influence is that of mastery experiences, which for pre-service teachers comes from actual teaching experiences with pupils. Most human behaviour is learned through observation and modelling (Bandura, 1977). Success raises self-efficacy, while failure lowers self-efficacy. Empirical evidence demonstrates that teachers' self-efficacy predicts teachers' aspirations (Muijs & Reynolds, 2002), attitudes towards innovation and change (Fuchs, Fuchs & Bishop, 1988), tendency to refer pupils to special education (Meijer & Foster, 1988), use of strategies (Woolfolk Hoy, Rosoff & Hoy, 1990), and persistence in teacher education (Glickman & Tamashiro, 1982) (see also Skaalvik & Skaalvik, 2010). Research on teacher self-efficacy has been conducted by Malinen and Savolainen, among others (2013). In a large international comparative study, Malinen and others explored the antecedents of teacher self-efficacy. They found that

positive experience in the practical teaching of a task (in this case, inclusive education) was the best predictor of teacher self-efficacy (Malinen et al., 2013). This is also in line with Bandura's (1997) theory and the findings of Savolainen, Engelbrecht, Nel and Malinen (2012), who found that Finnish pre-service teachers had lower self-efficacy with respect to managing behaviour than their South African counterparts (Savolainen et al., 2012). However, we were unable to find studies that explored how aspects of teacher education (for instance campus experiences and field experiences) contribute to Finnish pre-service teachers' instructional self-efficacy.

In this paper, we focus on how experiences in general pedagogy, subject didactics and teaching practice in teacher education influence pre-service teachers' instructional self-efficacy. Previous researchers have explored this area. For example, Woolfolk Hoy and Burke-Spero (2005) reported that beginning teachers who gave higher ratings of support also demonstrated stronger self-efficacy at the end of their first year (Woolfolk Hoy & Burke-Spero, 2005; Woolfolk & Hoy, 2000). The crucial element seems to be the support in place for pre-service teachers. In the Finnish context, school supervisors and peer pre-service teachers can provide guidance based on experience and verbal support. There is also evidence that teacher self-efficacy increases during teacher education but decreases during the first year of teaching in particular. Pendergast, Garvis and Keogh (2011) researched pre-service teachers' instructional self-efficacy in three educational contexts: early childhood, lower secondary education, and secondary education. They found that pre-service teachers in early childhood education reported the highest teacher self-efficacy (Pendergast, Garvis & Keogh, 2011).

Skaalvik and Skaalvik (2007) also found that teacher self-efficacy is a multidimensional concept, meaning that teachers' belief in their capabilities varies according to the tasks they must perform as teachers. They also pointed out that in certain schools, collective teacher self-efficacy may boost individual self-efficacy.

Research on pre-service teachers' instructional self-efficacy indicates that factors such as self-perceptions of instructional competency, personal characteristics (Poulou, 2007), emotional and pedagogical support from fellow pre-service teachers, and teacher training programs (Tschannen-Moran & Woolfolk Hoy, 2007) contribute to instructional self-efficacy.

Instructional self-efficacy with respect to classroom management and pupil engagement: Dependent variables

Building on previous research findings, we argue that it is important to study how certain aspects of teacher education programs support the development of pre-service teachers' belief in their ability to master even the more challenging tasks in teaching. We build on Bandura's comprehensive work, in which 'Self-efficacy refers to the belief in one's own capabilities to organise and execute the courses of action required to produce given attainments' (Bandura, 1997, p. 3).

From this general definition, we understand 'teacher self-efficacy' as teachers' belief in their own ability to carry out professional actions as teachers in various situations and relevant arenas. Capabilities, according to Bandura's definition and in the context of this study, refer to basic competencies and skills (see previous sections) related to classroom management and engaging pupils in learning. These capabilities need to be filtered through the person's belief that he or she is capable of teaching and generating reasonably good results in terms of professional attainment and pupil outcomes. Bandura (1997) maintained that it is not enough to have knowledge and be motivated to perform tasks. Self-efficacy is a generative capability in which cognitive, social-emotional, and behavioural sub-skills are organised and orchestrated to serve the purpose of fulfilling the teacher role: 'Self-referent thoughts activate cognitive, motivational, and affective processes that govern the translation of knowledge and abilities into proficient action' (Bandura, 1997, p. 37). Therefore, one's self-efficacy operates as a key organiser and motivator in his or her forethought to practice in general, and to teaching in particular. Even though teachers may be knowledgeable and have many skills, they may still consider themselves incapable of providing learning opportunities to their pupils and thus see themselves as poor practitioners.

Furthermore, self-efficacy is a differentiated set of beliefs linked to distinct functioning realms. It is perfectly possible for teachers to see themselves as capable of carrying out some tasks and less capable of carrying others (see Skaalvik & Skaalvik, 2007). Teacher self-efficacy is therefore a rather wide concept that encompasses numerous actions and practices related to functioning professionally as a teacher (Skaalvik & Skaalvik, 2007). Bandura elaborated on a large body of empirical evidence on the relationship between self-efficacy and other related variables that are important for human action. He pointed out that self-efficacy affects thought processes, the level and persistency of motivation, and affective states, all of which are particularly important for human action. Theoretically, we therefore argue that the extent to which teachers see themselves as efficient and capable of performing as professionals is of vital importance to their practice. Consequently, teacher education needs to support pre-service teachers' instructional self-efficacy beliefs. It is also important to explore how aspects of teacher education support and build teacher's self-efficacy.

Self-efficacy stems from numerous sources, and there is much to be said about the preconditions that determine how the sources operate. However, we must confine ourselves to a few main points. First, the most influential source of instructional self-efficacy is the teacher's enactive mastery experiences (Bandura, 1997, p. 80). Having positive experiences during practice is the best way for teachers to develop a robust belief in their own instructional capabilities. Failures undermine self-efficacy, and in this respect, it is the teacher's perception of her or his own performance that is important. Thus, while experiences of easy success may be positive for efficacious feelings, such feelings are also easily undermined by failures. Consequently, a more robust self-efficacy is developed when teachers have to work and overcome obstacles to achieve success. A teacher with robust self-efficacy understands that failures may occur, but that such failures can be overcome by effort, for example, by implementing different teaching strategies. In practice, teaching situations can be complex, challenging, and demanding in terms of

teachers' time and effort. For example, a pre-service teacher might have to handle challenging pupils while simultaneously addressing an educational agenda that requires him or her to provide practical instructions to pupils. Facing problems with pupils may induce inferior pre-service teachers' feeling of instructional self-efficacy. With other words, we expect a negative relation between pupils' problem behaviour and pre-service teachers' instructional self-efficacy. Problem behaviour places demands on the pre-service teacher's cognitive capacity. While teaching experiences can contribute to a more procedural knowledge, they also put pressure on the pre-service teacher's cognitive processing capacity. Thus, when a pre-service teacher finds that her or his cognitive processing capacity is exceeded, support and guidance from a supervisor can help the pre-service teacher find suitable strategies for managing similar professional situations.

A second source of self-efficacy beliefs is vicarious experiences, or modelling. In Finnish teacher education arrangements, school supervisors are not seen as models to be imitated. Supervisors are rather seen as experts who help pre-service teachers to find their own way to be a teacher. However, pre-service teachers may see the supervisor as a role model. But pre-service teachers may have several models, such as their own teachers in school, peer pre-service teachers and supervisors they have observed, and most importantly, the teachers they observe during their teaching practice. For most actions required of teachers, there is no fixed scale of success. Generally, teacher professionals are dependent on feedback from their environments, as well as from their models, to judge their performance and thus develop beliefs about their own instructional capabilities. By learning from other teachers' behaviour, as well as by comparing their own performance to that of other key individuals, pre-service teachers can develop and enhance their own instructional self-efficacy.

A third source is verbal persuasion, or information from the environment. Such expression can come from almost anyone, but trusted significant individuals often have a more influential voice. Evaluation and feedback in education is important, particularly when such feedback highlights capabilities and is related to pupils' efforts (Bandura, 1997). In Finnish teacher education, there are several teacher educators, who may be seen as models. However, supervisors may play a key role in all of them.

Supporting pupil learning is an important pre-service teacher task. Therefore, pre-service teachers must be not only confident in their teaching, but also capable of building learning confidence in others. This dimension focuses on the pre-service teacher's expectation of being able to teach pupils, explain the subject content, and answer questions to improve pupils' understanding. This skill is called *pupils engagement*. In our research, we identified another important construct: pre-service teachers' self-efficacy with respect to *classroom management*. Both these constructs build on the work of Skaalvik and Skaalvik (2007).

Explanatory variables

Our primary aim is to study the various effects of teacher education on pre-service teachers' instructional self-efficacy. This goal explains our focus on program-related experiences and variables. A critical test for pre-service teachers' instructional self-efficacy

beliefs is to examine how well they have mastered managing various irregular classroom behaviours. Thus, in our research, we included a variable that measures pre-service teachers' teaching experience related to managing various challenging behaviours or situations, such as pupils breaking the rules, making noise, leaving their desks without good reason, and failing to bring the relevant books to class. In our model, we call this *problem behaviour*. We expect that perceived negative experiences lead to feelings of a lack of teacher success, and that such feelings negatively affect pre-service teachers' instructional self-efficacy.

In our research, we address some of the challenges that have been voiced in teacher education and that may influence pre-service teachers' teaching qualifications and self-efficacy beliefs. One of these challenges involves integrating complex knowledge with teaching practice. In universities, the integration of academic subjects, and particularly subject didactics (why, what, and how to teach a subject in school and what is the nature of discipline and school subject), and general pedagogic knowledge with teaching practice has been repeatedly voiced as a problem over past decades.

Finnish teacher educators have different professional backgrounds, from subject disciplines to subject didactics, psychology, sociology, and general education. Thus, pre-service teachers may experience knowledge introduced in teacher education as fragmented, and at times contradictory or even irrelevant. They may also be less able to utilise aspects of the content knowledge in their teaching practice. On the other hand, pre-service teachers' experiences of a relevant and supportive teacher education most likely leads to meaningful teacher education experiences. This likely provides better competencies for successful practice and thus enhances teacher self-efficacy. Teacher education studies include coursework on general pedagogy and subject didactics. These are basic resources for pre-service teachers' in classroom planning, as well as in their reflections on classroom experiences. We have captured pre-service teachers' views in terms of practical examples and the connection between theory and practice in *general pedagogy* and pre-service teachers' views on relevant academic content and connection between theory and practice in *subject didactics* as predictors. We expect that perceived knowledge on general pedagogy and subject pedagogy predict pre-service teachers' self-efficacy with respect to classroom management and pupil engagement.

We also included a variable that reflects feedback from teaching practice supervisors. It is plausible that clear *supervisor feedback* is important for professional development, as supportive feedback can help the pre-service teachers develop classroom practices, overcome negative experiences, and support their belief in their own competencies. It should be noted that in Finland, the main venue for teaching practice is university training schools. Teachers in training schools are dedicated to supervising pre-service teachers, which is a key part of their daily work. The active support of supervisors is therefore important, if not critical, to pre-service teachers' mastery experiences in the teaching profession. Particularly, we suggest that supervisors play a crucial role when pre-service teachers need to overcome classroom experiences that negatively affect their self-efficacy beliefs.

Method

Survey as research method

The survey (N = 135) was conducted in Finland. There were two cohorts available for the research: first biology, chemistry, physics, and mathematics pre-service teachers, and second, pre-service class teacher students. Pre-service teachers with other subjects were not available for research. Data were gathered during the winter and autumn of 2015. Biology, chemistry, physics, and mathematics pre-service teachers in a pedagogical education course were given a paper-based questionnaire during a compulsory seminar session on teaching practices. All pre-service teachers who were present in the seminar session participated in the research. At the time of the data collection, the biology, chemistry, physics, and mathematics pre-service teachers had completed approximately two-thirds of their pedagogical education. The respondents varied from second-year undergraduates to pre-service teachers having a Masters degree or even a PhD. Participants in the second cohort, pre-service class teachers, were given a paper-based questionnaire during their first lecture of the class teacher education program for fourth-year pre-service teachers (during which pre-service teacher attendance was compulsory). In this phase, the pre-service teachers were told that they would receive the preliminary results of the pre-service teacher survey. With the exception of one pre-service teacher, all pre-service teachers present in the lecture answered the questionnaire. In both cohorts, pre-service teachers were told that answering it was voluntary, and that the questionnaire was part of an international comparative research study (Christophersen, Elstad, Juuti, Solhaug & Turmo, 2017).

Measurement instruments

A questionnaire was constructed based on measurement instruments previously reported in the literature, and on new developments (Haladyna & Rodriguez, 2013). Reported instruments were adapted and translated into the Finnish language. In the survey, the pre-service teachers responded to items on a seven-point Likert scale in which the option 4 represented a neutral midpoint. All items were translated, adjusted, and analytically assessed to fit within our definitions of the relevant concepts. Each concept was measured with two to four individual items. The analysis reported in the following section is based on seven measurement instruments. The indicators and Cronbach's alpha for each concept are presented in the following paragraphs.

In constructing items to measure the dependent variables for pre-service teachers' instructional self-efficacy for this study, we are very much indebted to the work of Skaalvik and Skaalvik (2007). In order to keep survey short and ensure pre-service teachers' possibility to respond in reasonable time, we applied shortened version of their work. Table 1 shows the items and their corresponding constructs and alphas.

Table 1: Constructs and items

Construct	Items	Alpha
Pupils' engagement	*How do you:* Motivate pupils who show little interest in school work? Convince pupils that they can do well in school? Convince pupils to value learning?	0.72
Classroom management	*How do you* Tackle the most troublesome pupils? Convince pupils to follow school rules? Create a safe environment for all pupils?	0.80
General pedagogy	I am given practical examples from actual teaching. The connection between pedagogic theory and practice is clear.	0.68
Subject didactics	I am familiar with academic content that is relevant to the work of a teacher. The connection between subject-didactic theory and practice is clear.	0.60
Supervisor feedback	Supervision meetings at my practice school help me understand what I should do to improve as a teacher. Supervisors at my practice school give me clear and direct feedback about where I stand. The feedback from supervisors at my practice school is in close accordance with what I have actually achieved. The feedback from supervisors at my practice school makes clear what is expected of me as a pre-service teacher.	0.88
Problem behaviour	*In the classroom, I have experienced:* Pupils disturbing their fellow pupils as they complete schoolwork. Pupils breaking class rules. Pupils making unnecessary noise. Pupils leaving their desks without asking permission.	0.84

Results

Structural equation modelling (SEM) was used to analyse the relationships between the variables. SEM is suitable for confirmatory factor analysis and path analysis. Assessments of fit between the model and data were based on the following indices: RMSEA (root mean square error of approximation), TLI (non-normed fit index), GFI (goodness-of-fit index), and CFI (comparative fit index). RMSEA < 0.05 and TLI, GFI, and CFI > 0.95 indicated a good fit, while RMSEA < 0.08 and TLI, GFI, and CFI > 0.90 indicated an acceptable fit (Kline, 2005). The measurement and structural models were estimated using IBM *SPSS Amos 21*.

We began our analysis by exploring the bivariate correlations between the latent variables in the structural equation modelling. The fit indexes RMSEA = 0.046, TLI = 0.95, GFI = 0.90, and CFI = 0.96 indicated that the structural model was a good fit.

Table 2: Bivariate correlations between latent variables

Variable	SS	SP	PP	PB	CM
Supervisor feedback					
Subject didactics	0.21*				
General pedagogy	0.12	0.52**			
Problem behaviour	-0.12	-0.05	-0.11		
Classroom management	0.14	0.09	0.23*	-0.20*	
Pupils' engagement	0.12	0.18*	0.29**	-0.14	0.56**
Note: Numbers refer to Pearson's r, and r > 0.15 is significant at the 5% level.					

The overall correlations (Table 2) between the independent variables – subject didactics, general pedagogy, and problem behaviour – were fairly low, except for the inter-correlation between general pedagogy and subject didactics, which was strong at r = -0.52, but not too strong for SEM regression modelling. Both constructs are variables that measure the integration of theory and practice in teacher education, which may explain their robust inter-correlation. As expected, problem behaviour is negatively correlated with classroom management and pupil engagement, though these correlations were rather low. Furthermore, problem behaviour was weakly correlated with supervisor feedback. Classroom management and pupil engagement were highly correlated at 0.56. Both subject didactics and general pedagogy were correlated with pupil engagement.
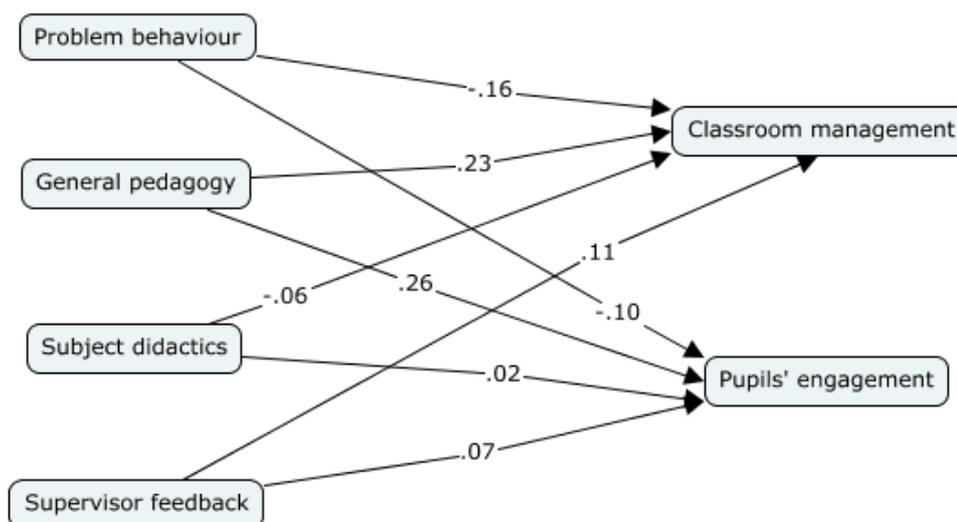

Figure 1: Structural equation modelling (N= 153)

Figure 1 presents the results of the structural equation modelling. We begin by commenting on how pre-service teachers' experiences with problem behaviour in the classroom predict how they perceive their abilities with respect to classroom management and pupil engagement. The regression coefficients for problem behaviour on classroom management and pupil engagement were between 0.26 and -0.10. The pupils' behaviour

that is in some way perceived by the pre-service teacher as irregular or disturbing tends to put a strain on the pre-service teacher and his or her teaching. Such perceptions may make teachers feel unsuccessful. As expected, the results indicate that problem behaviour has a negative effect on pre-service teachers' instructional self-efficacy, but that its effects are moderate.

Our model uses the experience of problem behaviour as a control variable for the three program contributions variables. We found that practical examples and connection between theory and practice in *general pedagogy* courses predicts *classroom management* ($\beta = 0.23$). *General pedagogy* also predicts *pupils' engagement* ($\beta = 0.26$). One possible rationale for this is that general pedagogy courses focus on, for example, pupils' behaviour, psychological development, and special needs. Classroom management is not taught explicitly at the case university. However, classroom management issues are taught implicitly in general pedagogy courses. Subject didactics courses focus more on pedagogical content knowledge of specific subjects. On the one hand, class teacher students complete short courses on every school subject, from music education to mathematics education and from physics education to physical education.

On the other hand, subject pre-service teachers study pedagogical content knowledge in only two of their teaching subjects. Therefore, these subject pedagogy courses differ quite a lot from each other, depending on nature and tradition of the subject and the research interest of the teachers in the course. While pedagogy courses provide general knowledge about pupils and teaching, subject pedagogy courses require certain subject knowledge. This can cause challenges for many pre-service class teachers, especially those focusing on mathematics, chemistry, physics, and technology-oriented handicraft subjects, with which pre-service teachers are often not very familiar. General pedagogical examples and connections between general pedagogy theory and practice can be seen as more applicable from the classroom management and pupil engagement perspectives. Subject didactics focuses more on what is the relevant content of the teaching (including conceptual and procedural knowledge), how to organise subject knowledge in a way that pupils can learn the content, and how to assess pupils' learning. According to our results, general pedagogy has a medium effect on pupil engagement.

Supervisor feedback also has rather small effects on classroom management ($\beta = 0.11$) and pupil engagement ($\beta = 0.07$). This lends some support to the notion that feedback from supervisors in schools can positively affect pre-service teachers' abilities to classroom manage and support pupils engagement. In Finnish universities, supervising teachers are present in the classroom the entire time that pre-service teachers are teaching in practice schools. Thus, handling possible behavioural problems is the supervising teachers' responsibility. However, if pre-service teachers face behavioural problems, he or she tries to handle these first. If the pre-service teacher succeeds, then he or she may feel high self-efficacy.

Discussion

We begin by addressing pre-service teachers' experiences with problem behaviour among pupils during their teaching practice. In teacher education, pre-service teachers are challenged to use a variety of classroom competencies in order to teach. While their main task is to facilitate learning, they also must organise information and manage numerous issues of importance to learners. Pre-service teacher teaching practices are focused on developing the social and leadership skills that pre-service teachers need to provide an effective classroom learning environment. In practice, pre-service teachers inevitably experience challenging situations, and through these situations, they learn how to handle these. Generally, this finding supports the notion that self-efficacy beliefs are developed through active support from certain individuals. However, the low connection between feedback and self-efficacy raises questions about the nature of feedback.

This study revealed important findings regarding the integration of pedagogy and practice, which is positively associated with pre-service teachers' perceived ability to both manage classrooms and boost pupil motivation and engagement in learning activities.

As emphasised earlier, teacher education is complex, involving several actors with different backgrounds. Thus, teacher educators face the challenge of helping pre-service teachers integrate the knowledge and skills they acquire during their studies to ensure they have the required competencies and are ready to work independently as teachers. Currently, teacher education struggles to achieve this integration.

The SEM is a regression model that controls for the effects of independent variables. This model demonstrated that general pedagogy is more important than subject didactics in supporting pre-service teachers' instructional self-efficacy with respect to classroom management and pupil engagement.

Conclusion, limitations, and implications

The present study highlights important contributions that teacher education programs make to pre-service teachers' instructional self-efficacy with regard to classroom management and pupil engagement. First, if pre-service teachers receive practical, real-world teaching examples and the connection between pedagogic theory and practice is made clear in general pedagogy courses, then the pre-service teachers have high self-efficacy with respect to their classroom management and pupil engagement abilities. Second, the study unexpectedly found that supervisors' feedback contributes very little to instructional self-efficacy. Furthermore, the connection between subject didactics theory and practice did not contribute to either classroom management or pupil engagement self-efficacy. Finally, as expected, we found that negative experiences resulting from problem behaviour in the classroom reduced pre-service teachers' instructional self-efficacy with respect to their classroom management and pupil engagement abilities.

Limitations

Consistent with related studies, this study has clear limitations from a methodological (e.g. cross-sectional) perspective, as well as from a conceptual perspective (e.g. parsimonious modelling). We acknowledge these limitations and argue that addressing them can serve as the foundation for future studies.

This research focused only one university. Further, there were only biology, chemistry, physics and mathematics pre-service teachers and pre-service class teachers in the sample. Thus, there needs to be care about generalising the results. However, national-level coordination between teacher education units and the Ministry of Education and Culture in Finland ensure that programs in different universities are comparable.

A pre-service teacher's self-efficacy beliefs can influence his or her teaching-related beliefs and orientations, interactions with pupils, and perceptions of pupils. However, multiple factors influence pre-service teachers' behaviour. Cross-sectional studies represent only a momentary glimpse, and they do not allow for the testing of causal relationships among exogenous and endogenous variables. Furthermore, reversed causation may play a role. With regard to the present study, omitted variables may have influenced the overall model, and variables that are missing from the model could be important. More longitudinal research is needed to address the complexity of the dynamics between beliefs and actions.

Another limitation of this study is the use of self-reported questionnaire data. The subjective component of such data is undeniable. Independent judgements by peers, supervisors, teacher educators, and others can provide interesting data about pre-service teachers' beliefs, but it is difficult to acquire this data while honouring promises of anonymity. Furthermore, it is possible that factors that were not included in our model also influence pre-service teachers' instructional self-efficacy. This study examined only a very limited number of antecedents of teachers' instructional self-efficacy beliefs.

Implications for practice and further studies

The purpose of this study was to explore potential antecedents of pre-service teachers' instructional self-efficacy beliefs, and it makes important contributions in this area, despite its limitations. Teacher education provides environments in which pre-service teachers can develop professional competencies in order to work independently as a teacher. Bandura (1997) proposed four major influences on pre-service teachers' instructional self-efficacy beliefs: mastery experiences, verbal persuasion, vicarious experiences, and physiological arousal. One key influence is mastery experiences, which, for pre-service teachers, comes from real teaching experiences with pupils.

First, supervisors need to work closely with pre-service teachers regarding their experiences with problem behaviour in the classroom and their possible negative contributions to pre-service teachers' instructional self-efficacy. Second, feedback from supervisors of practice contributes positively to pre-service teachers' instructional self-efficacy beliefs. There is also a need to explore how supervisors develop pre-service

teachers' instructional self-efficacy through their tutoring. Third, pre-service teachers' perceptions regarding the practical examples and the connection between theory and practice in general pedagogy and how they affect pre-service teacher's self-efficacy beliefs are important. Fourth, the role of pedagogical content knowledge for pre-service teacher self-efficacy for classroom management and pupil engagement was very low.

Finally, it is also important to study how supervisors understand and address their pre-service teachers' practice experiences in relation to their self-efficacy. A very important question for teacher education is what knowledge should be presented, and how, to provide a sound basis for teaching and reflection, and in particular, encourage pre-service teachers' instructional self-efficacy.

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