Primary school teachers’ sense of professional agency and inadequacy in teacher–student interaction

Roosa Yli-Pietilä, Tiina Soini, Janne Pietarinen and Kirsi Pyhältö

Faculty of Education and Culture, Tampere University, Tampere, Finland; School of Applied Educational Science and Teacher Education, University of Eastern Finland, Joensuu, Finland; Faculty of Educational Sciences, University of Helsinki, Helsinki, Finland; Centre for Higher and Adult Education, University of Stellenbosch, Stellenbosch, South Africa

ABSTRACT
The study investigated Finnish in-service primary school teachers’ (N = 815) sense of professional agency and inadequacy in teacher–student interaction over a five-year period. Teachers’ professional agency refers to a capacity that prepares for new learning, and consists of teachers’ motivation, self-efficacy beliefs, and strategies for learning. Analyses were conducted using structural equation modelling and the cross-lagged panel model. The results showed that Finnish primary school teachers experience strong and stable professional agency, as well as moderate and stable levels of inadequacy over time. In particular, teachers’ efforts to build collaborative learning environments and revise pedagogical practices can reduce the sense of inadequacy in teacher–student interaction.

Introduction
Teacher–student relationships constitute one of the most important sources of the intrinsic rewards of teaching and, therefore, a precondition for teacher learning (Koca 2016; Lasky 2005; Robinson 2022; Roorda et al. 2011). Teacher learning, in turn, has been shown to contribute to students’ school engagement and learning (Eccles and Roeser 2011; Hofkens and Pianta 2022; Ulmanen et al. 2016), encourage teachers to experiment with new teaching methods, and increase their commitment to school development (e.g. Bakkenes, Vermunt, and Wubbels 2010; Hargreaves and Fullan 2012). Accordingly, teachers who are willing and have the confidence and skills to learn about and transform teaching practices see students as a resource for their own learning (Edwards 2005, 2007; Pietarinen, Pyhältö, and Soini 2016; Pyhältö, Pietarinen, and Soini 2014; Soini, Pietarinen, and Pyhältö 2016). This type of professional agency in the classroom has been shown to have positive effects on teachers’ perception of their work as meaningful, and to reduce gradually progressing teacher burnout symptoms and turnover intentions (Heikonen et al. 2017a; Pyhältö, Pietarinen, and Soini 2015; Soini, Pietarinen, and Pyhältö 2016).

CONTACT Roosa Yli-Pietilä roosa.yli-pietila@tuni.fi Faculty of Education and Culture, Tampere University, Tampere, Finland

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However, non-functional teacher–student interaction has also been shown to be one of the most significant sources of teacher-experienced inadequacy in their everyday work (Pietarinen et al. 2013a; Schaufeli and Salanova 2007; Skaalvik and Skaalvik 2010). More specifically, challenging teaching-learning situations with students, such as dealing with the loss of study motivation, disturbing behaviour, or students’ challenging life situations, may arouse feelings of inadequacy in their work (Ahonen et al. 2014; Soini et al. 2012; Soini, Pyhältö, and Pietarinen 2010). Hence, teacher success in learning to construct and co-create collaborative learning environments for all students and reflecting their own teaching behaviour from the perspective of students’ learning seems to be a fundamental precondition for teachers to sustain a sense of professional agency in their work with students (Pietarinen, Pyhältö, and Soini 2016; Soini, Pietarinen, and Pyhältö 2016). A teacher’s sense of professional agency and feelings of inadequacy, especially in teacher–student interaction, seem to be intertwined, and it may be argued that they are related to each other in the course of a teaching career. However, only a few longitudinal studies have followed up the intertwined relation between a teacher’s agentic learning and feelings of inadequacy (e.g. Day and Gu 2007; Vermunt and Endedijk 2011).

This study contributes to the gap in the literature by examining the stability of Finnish primary school teachers’ sense of professional agency over a five-year period. The focus is on teacher learning at the core of a teacher’s work; transforming pedagogical practices with students in the classroom. The aim of the study is also to investigate how a teacher’s sense of inadequacy in teacher–student interaction is related to their sense of professional agency, and how the complex relation between these two develops over a period of five years.

**Teachers’ professional agency in the classroom**

Teacher learning is considered to be the key to solving challenges faced in school, as well as to developing school and teaching (e.g. Bruce et al. 2010; Darling-Hammond et al. 2009; Korthagen 2010). Much of teachers’ everyday learning happens in intensive interaction with students in the classroom, which is the main context for teacher learning (Darling-Hammond 2008; Korthagen 2010; Kyndt et al. 2016). It has been asserted that teachers learn constantly while teaching, although learning is often viewed as an unintentional and automatic process that happens, for instance, owing to increased work experience and career development (Bransford et al. 2005; Pietarinen, Pyhältö, and Soini 2016).

However, teachers’ active efforts to learn (or the lack thereof) cannot be reduced to a single behavioural attribute or be explained with a single feature or orientation, such as the level of motivation or professional beliefs (Bandura 1997; Hoy 2008; Lam, Cheng, and Choy 2010). Accordingly, integrative concepts (Cong-Lem 2021; Salomon 1996; Toom et al. 2021; Toom, Pyhältö, and Rust 2015; Vermunt and Endedijk 2011) are needed to understand the complexity of teacher learning. We use the term *professional agency* to refer to a teacher’s capacity to prepare the way for the intentional and responsible management of new learning in their everyday work (Pietarinen, Pyhältö, and Soini 2016; Pyhältö, Pietarinen, and Soini 2014; Pyhältö, Soini, and Pietarinen 2012; Soini, Pietarinen, and Pyhältö 2016).

A teacher’s professional agency in the classroom contributes to new learning at the core of their work in pedagogical practices with students. In practice, students are seen as
resources for learning, and the teacher’s own learning is reflected constantly while teaching and interacting with all students. A teacher’s professional agency consists of a teacher’s will to learn, motivation; confidence in learning, self-efficacy beliefs; and skills to learn, strategies (Pietarinen, Pyhältö, and Soini 2016; Pyhältö, Pietarinen, and Soini 2014, 2015; Pyhältö, Soini, and Pietarinen 2012; Soini, Pietarinen, and Pyhältö 2016). Teachers’ strong sense of professional agency appears in the classroom as teachers’ efforts to construct and create collaborative learning environments and use transformative practices in interaction with students, as well as efforts to reflect and further develop their own teaching practices (e.g. Brown et al. 2021; Byman et al. 2009; Gibbons et al. 2021; Pietarinen, Pyhältö, and Soini 2016; Soini, Pietarinen, and Pyhältö 2016; Vermunt and Endedijk 2011).

Accordingly, active and intentional learning is often collaborative, and teacher–student interaction is viewed as a bi-directional process, where students and a teacher learn from each other (Edwards 2005). More specifically, a teacher who learns actively tends to use diverse learning strategies that contribute to developing transformative teaching practices, such as meaning-oriented problem solving, self-regulative evaluation, and reflection (Brown et al. 2021; Gibbons et al. 2021; Hoekstra et al. 2007; Illeris 2009; Lohman and Woolf 2001; Saariluoma et al. 2016; Zimmermann 2008). It has also been shown that teachers’ capacity for active and intentional learning and for using different learning strategies is associated with innovative classroom practices, better student achievement, and engagement in school reforms and can result in reduced risk of burnout (Bakkenes, Vermunt, and Wubbels 2010; Charteris and Smith 2017; Pyhältö, Pietarinen, and Soini 2015; Soini, Pietarinen, and Pyhältö 2016).

The degree of a teacher’s experienced professional agency has been found to vary depending on the context and task at hand (Borko 2004; Boyle, Lamprianou, and Boyle 2005; Heikonen et al. 2020; Klassen et al. 2011; Lipponen and Kumpulainen 2011). Contextual features, such as changes in society, students’ families, and school reforms, put pressure on teacher learning and may challenge a teacher’s perceived professional agency, i.e. their will and confidence and skills in learning in the classroom together with students. There is additional evidence that a teacher’s sense of professional agency is related to their perceived burnout symptoms triggered by the challenges faced in the school’s social context. More specifically, a teacher’s strong sense of professional agency has been found to reduce perceived exhaustion and feelings of inadequacy in teacher–student interaction (Heikonen et al. 2017a; Soini, Pietarinen, and Pyhältö 2016).

**Inadequacy in teacher–student interaction**

Teacher–student relationships constitute one of the most important contexts for learning and teaching (Brinkworth et al. 2018). A teacher’s ability to create functional relations with students and construct a socially supportive learning environment in the classroom is essential in order to achieve the aims set for the students’ academic work at school (Bruce et al. 2010; Darling-Hammond 2008; Frymier and Houser 2000; Kincade, Cook, and Goerdt 2020; Roorda et al. 2011; Soini et al. 2012). It has been found, for instance, that a teacher’s perceived work engagement affects their teaching behaviour and the extent to which flexible, encouraging, and constructive pedagogical practices have been adopted in the classroom community (Hakanen, Schaufeli, and Ahola 2008; Schaufeli and Salanova 2007).
Accordingly, the previous studies suggest that functional teacher–student relationships not only promote learning in the classroom but also contribute to students’ and teachers’ well-being (Evers, Brouwers, and Tomic 2002; Frymier and Houser 2000; Kincade, Cook, and Goerdt 2020).

However, if functional teacher–student interaction is not constructed in the classroom, it may appear as feelings of inadequacy in the teacher (Darling-Hammond 2008; Frymier and Houser 2000; Heikonen et al. 2017a; Soini et al. 2012; Soini, Pyhältö, and Pietarinen 2010). A teacher’s perceived inadequacy usually refers to their experience of insufficient competence in challenging situations with students. Teachers may perceive a lack of skills in regulating students’ learning or experience constant disappointment owing to problematic situations with students (Berliner 1986; Maslach, Schaufeli, and Leiter 2001; Pietarinen 2013a; Skaalviik and Skaalviik 2010). Teachers also experience moderately high levels of inadequacy in their work (Pietarinen et al. 2013a). Findings on changes in the levels of a teacher’s sense of inadequacy are partly contradictory. It has been asserted that burnout symptoms remain relatively stable over time (Hakanen, Schaufeli, and Ahola 2008), but other findings also indicate that there are different trajectories among teachers owing to changes in perceived burnout symptoms during their career (e.g. Hultell, Melin, and Gustavsson 2013).

Previous research indicates that perceived cynicism and exhaustion are at the core of gradually progressing teacher burnout, whereas perceived inadequacy in a teacher’s work functions differently (e.g. Hakanen, Bakker, and Schaufeli 2006; Maslach and Jackson 1981; Maslach, Schaufeli, and Leiter 2001; Pietarinen et al. 2013b; Schaufeli and Salanova 2007). For example, it has been asserted that feelings of inadequacy are the result of other burnout symptoms (Taris et al. 2005), and they are typically sourced in the challenges perceived in teacher–student interaction (Soini, Pyhältö, and Pietarinen 2010), such as more heterogeneous student groups, increased special educational needs, and challenging relationships with parents (Aloe, Amo, and Shanahan 2014; Lindqvist et al. 2017; Schaufeli and Salanova 2007; Skaalviik and Skaalviik, 2010). Hence, the pedagogical situations with students can either be rewarding and exciting or burdening and stressful for the teacher (Pietarinen et al. 2013a; Soini et al. 2012).

A teacher’s professional agency in the classroom is essential for active and intentional learning and tackling perceived inadequacy when working with students (Chong and Kong 2012; Pietarinen et al. 2013a; Soini, Pietarinen, and Pyhältö 2016; Yost 2006). It has been shown that a teacher’s attributions related to challenging classroom situations vary depending on the teacher’s resources and capacity to transform pedagogical practices to fit all students’ needs (De Vries, Jansen, and van de Grift 2013; Hoekstra et al. 2007; Soini, Pyhältö, and Pietarinen 2010). For instance, some studies focus on the relations between a teacher’s self-efficacy beliefs and burnout, but the findings have been somewhat conflicting regarding inadequacy, since both negative and positive correlations between inadequacy and self-efficacy have been indicated (Aloe, Amo, and Shanahan 2014, Brown 2012; Evers, Brouwers, and Tomic 2002). This may indicate that the complexity of teacher learning should be approached by taking into account not only the sense of efficacy but also the perceived motivation and strategies used for transforming teaching practices and students’ learning behaviour in the classroom. Previous research suggests that teachers who have a strong sense of professional agency perceive difficulties in teacher–student relationships as challenges, and they invest their efforts in solving them (Soini et al. 2012;
Soini, Pyhältö, and Pietarinen 2010). On the other hand, teachers with a lower sense of agency in terms of their own learning may perceive that there is not much they can do, which decreases their sense of accomplishment and results in feelings of inadequacy in teacher–student interaction in the long term (Aloe, Amo, and Shanahan 2014, Hong 2012; Pietarinen et al. 2013a; Soini, Pietarinen, and Pyhältö 2016; Soini, Pyhältö, and Pietarinen 2010).

**Materials and methods**

**Aim of the study**

This study aims to gain a better understanding of the complex interrelation between primary school teachers’ sense of professional agency and perceived inadequacy in teacher–student interaction. The study examines the stability of teachers’ sense of professional agency and perceived inadequacy in teacher–student interactions over a five-year period. In addition, the study examines the extent to which this perceived inadequacy can be predicted by the teachers’ sense of professional agency, i.e. perceived capacity to develop a collaborative learning environment and use transformative practices, as well as reflect their own success in teaching situations and students’ ways of learning in the classroom over a five-year period. Based on previous research on teachers’ professional agency (Pyhältö, Pietarinen, and Soini 2014, 2015; Soini, Pietarinen, and Pyhältö 2016) and perceived inadequacy in terms of teacher–student interaction (Aloe, Amo, and Shanahan 2014, Brown 2012; Heikonen et al. 2017a; Maslach, Schaufeli, and Leiter 2001; Taris et al. 2005), the following hypotheses (see Figure 1) were tested:

**H1.** Teachers’ sense of professional agency in the classroom is embodied within and over time by creating a collaborative environment and aiming at transformative practice

![Figure 1. Hypothesised model of longitudinal relations between teacher’s professional agency and inadequacy in teacher–student interaction.](image-url)
with students (CLE) and reflection in the classroom (REF). Both of these include aspects of motivation, efficacy beliefs, and activities for facilitating and managing teachers’ learning (Pietarinen, Pyhältö, and Soini 2016, Pyhältö et al. 2012; Pyhältö, Pietarinen, and Soini 2014; Soini, Pietarinen, and Pyhältö 2016). These modes of teacher learning contribute to each other over time. More specifically, a teacher’s active and intentional learning in terms of renewing their teaching practices provides not only the capacity to reflect on their own teaching behaviour but also their perceived motivation, efficacy, and skills in monitoring, modifying, and experimenting with novel teaching practices in participatory ways that acknowledge the students’ feedback and varying needs (Pietarinen, Pyhältö, and Soini 2016; Soini, Pietarinen, and Pyhältö 2016).

H2. Teachers’ efforts to build a collaborative environment and transform pedagogical practices (CLE) and their tendency to reflect on their own work and professional learning (REF) along with the perceived inadequacy of teacher–student interaction (INAD) can be predicted by themselves over time. In other words, the sense of professional agency in the classroom predicts a teacher’s capacity to develop teaching practices later in their career, and in turn, the perceived inadequacy in teacher–student interaction may predict an increased sense of inadequacy in late career (Hakanen, Schaufeli, and Ahola 2008; Hultell, Melin, and Gustavsson 2013).

H3. A teacher’s strong sense of professional agency (i.e. high CLE and REF) in the classroom correlates negatively with the perceived inadequacy in terms of teacher–student interaction (INAD) within time and reduces it over time (Aloe, Amo, and Shanahan 2014, Hong 2012; Soini, Pyhältö, and Pietarinen 2010). More specifically, a teacher’s perceived capacity to transform pedagogical practices through the intentional and active learning that is realised in resilient ways of modifying teaching to adjust to different groups of students and utilising feedback from students reduces within and over time the perceived inadequacy in teacher–student interaction (Heikonen et al. 2017a; Soini, Pietarinen, and Pyhältö 2016).

Method

Research context

Finnish comprehensive school comprises primary school for children 7–12 years old, and lower secondary school, for children aged 13–15. This study focuses on in-service primary school teachers in Finland. All Finnish primary school teachers have completed a Master’s degree in educational science. Finnish primary teacher education consists of two degrees, a bachelor’s degree and a master’s degree. Bachelor studies (180 ECTS) include basic and intermediate studies in education and multidisciplinary studies, which include studies in each primary school subject. Master studies (120 ECTS) include advanced and compulsory additional studies. In primary school, teachers have their own classes (approximately 20–30 students), and they teach nearly every school subject to the class.

The time period in this survey includes, e.g. curriculum reform (FNBE 2014) and the implementation of a three-level support system (Basic Education Act 642/2010). The longitudinal design of the study allows identifying possible changes in a teacher’s
professional agency in the classroom during these reforms. The discussion in Finnish media regarding the teaching profession has also been lively during the last decade. The main issues have been teachers’ exhaustion, larger group sizes in the classrooms, inclusion and students’ different special educational needs, and emotional and behavioural challenges. The ongoing discussion has increased negative impressions of the teaching profession and has significantly decreased the number of applicants to teacher education.

**Participants**

All of the participants were in-service primary school teachers \( n(T1) = 815, n(T2) = 525 \), see Table 1). The majority of the participants were women \( T1: 79\%, T2: 80\% \), which is characteristic for the teaching profession in Finland. Participants were distributed evenly according to their work experience. The response rate at the second time of measurement was good, at 64\%. The data are part of the national longitudinal survey data that were collected in the years 2011 \( n = 2310 \) and 2016 \( n = 1478 \) using a probability sampling method \( n = 6000 \); see more in Pyhältö, Pietarinen, and Soini 2015). The data were collected as a mail-in survey. Participants were primary, subject, and special education teachers in comprehensive schools, but only primary school teachers are included in present study. The data collection was based on informed consent and the guidelines for responsible conduct of research and ethical principles (Finnish Advisory Board for Research Integrity 2019).

**Measures**

The Teachers’ Professional Agency instrument was used to measure teacher learning in the classroom and in their work with students (Pyhältö, Pietarinen, and Soini 2015; Soini, Pietarinen, and Pyhältö 2016). The Teachers’ Professional Agency in the classroom scale includes two subscales: 1) Collaborative environment and transformative practice (4 items), and 2) Reflection in the classroom (6 items). The inadequacy in the teacher–student interaction sub-scale (3 items) that is part of the Socio-contextual Teacher Burnout Scale developed to measure teachers’ context-specific stressors in everyday work was also used in this study (Maslach, Schaufeli, and Leiter 2001; Pietarinen et al. 2013a, 2013b). All of the scales and items are shown in Appendix 1. The items of the scales were rated on a Likert scale from 1 (completely disagree) to 7 (completely agree). The Cronbach’s alpha reliabilities of the scales are provided in Table 3.

<table>
<thead>
<tr>
<th></th>
<th>T1</th>
<th>T2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender (N/%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>642/78.8%</td>
<td>421/80.2%</td>
</tr>
<tr>
<td>Male</td>
<td>172/21.1%</td>
<td>104/19.8%</td>
</tr>
<tr>
<td>Total Response rate (T2) 64.4%</td>
<td>815</td>
<td>525</td>
</tr>
<tr>
<td>Work experience (years)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Min/Max</td>
<td>1/41</td>
<td>1/56*</td>
</tr>
<tr>
<td>Mean</td>
<td>19.02</td>
<td>21.88</td>
</tr>
</tbody>
</table>

*A few participants were on maternity leave, which means that their work experience was not affected during the study.*
Measurement invariance and structural equation modelling

The data analysis included two phases. First, the measurement invariance was tested for the scales used, and the second phase consisted of building the longitudinal model. The measurement invariance test shows if the scales remain invariant over time. If the scales are invariant, that is a good basis for analysing the data longitudinally by structural equation modelling (SEM).

The measurement invariance was tested with the MLR estimator using Mplus (Version 8; Muthén and Muthén 2010). The missing data were treated using the full information maximum likelihood estimation that is the default for Mplus. All three scales were tested separately using confirmatory factor analysis (CFA). Some modifications were made for each of the CFA models to reach adequate model fit for the baseline models. The statistics used to evaluate the model fit were the χ², CFI, TLI, RMSEA, and SRMR. The criteria for the model fit estimates were the following: a non-significant p-value for the χ² test (Satorra-Bentler’s scaled Chi-square test was used to better approximate Chi-square under non-normality); a Comparative Fit Index (CFI), and a Tucker-Lewis index (TLI) greater than 0.90 represented adequate fit, and greater than 0.95 represented a good fit; a Root Mean Squared Error of Approximation (RMSEA) less than 0.06 represented a good fit and less than 0.08 was a mediocre fit; and a Standardized Root Mean Square Residual index (SRMR) below 0.08 represented a good fit (Byrne and Stewart 2006; Hooper, Coughlan, and Mullen 2008; Lei and Wu 2007).

The measurement invariance was tested at three levels: configural, metric, and scalar invariance. The differences between the model fit indices of the baseline model and the constrained models were compared. The criteria for the acceptable difference were that the indices would not decrease more than 0.01 altogether (Chen 2007; Cheung and Rensvold 2002). The test showed that one of the tested models (collaborative environment and transformative practice) was fully invariant when the factor loadings and intercepts were constrained (see Table 2). The two other models (Reflection in the classroom and Inadequacy in teacher–student interaction) were invariant when the factor loadings were constrained, but the model fit indices decreased too much when the

<table>
<thead>
<tr>
<th>Table 2. Model fit comparison of the models.</th>
<th>χ²</th>
<th>df</th>
<th>p*</th>
<th>CFI</th>
<th>TLI</th>
<th>RMSEA</th>
</tr>
</thead>
<tbody>
<tr>
<td>CLE</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baseline model</td>
<td>179,833</td>
<td>50</td>
<td>0.941</td>
<td>0.922</td>
<td>0.056</td>
<td></td>
</tr>
<tr>
<td>Factor loadings invariant</td>
<td>185,903</td>
<td>55</td>
<td>0.28</td>
<td>0.940</td>
<td>0.928</td>
<td>0.054</td>
</tr>
<tr>
<td>Measurement intercepts invariant</td>
<td>212,527</td>
<td>60</td>
<td>0.00</td>
<td>0.930</td>
<td>0.923</td>
<td>0.056</td>
</tr>
<tr>
<td>REF</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baseline model</td>
<td>41,918</td>
<td>17</td>
<td>0.976</td>
<td>0.960</td>
<td>0.042</td>
<td></td>
</tr>
<tr>
<td>Factor loadings invariant</td>
<td>49,382</td>
<td>20</td>
<td>0.06</td>
<td>0.972</td>
<td>0.960</td>
<td>0.042</td>
</tr>
<tr>
<td>Measurement intercepts invariant</td>
<td>92,916</td>
<td>23</td>
<td>0.00</td>
<td>0.932</td>
<td>0.918</td>
<td>0.061</td>
</tr>
<tr>
<td>Partially invariant: Measurement intercepts invariant, released Ref21 and Ref21_2</td>
<td>59,153</td>
<td>22</td>
<td>0.00</td>
<td>0.964</td>
<td>0.954</td>
<td>0.046</td>
</tr>
<tr>
<td>INAD</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baseline model</td>
<td>40,988</td>
<td>7</td>
<td>0.957</td>
<td>0.908</td>
<td>0.077</td>
<td></td>
</tr>
<tr>
<td>Factor loadings invariant</td>
<td>42,798</td>
<td>9</td>
<td>0.76</td>
<td>0.957</td>
<td>0.929</td>
<td>0.068</td>
</tr>
<tr>
<td>Measurement intercepts invariant</td>
<td>66,411</td>
<td>11</td>
<td>0.00</td>
<td>0.930</td>
<td>0.904</td>
<td>0.079</td>
</tr>
<tr>
<td>Partially invariant: Measurement intercepts invariant, released [Inad33 Inad33_2]</td>
<td>43,774</td>
<td>10</td>
<td>0.68</td>
<td>0.957</td>
<td>0.936</td>
<td>0.064</td>
</tr>
</tbody>
</table>

*Satorra-Bentler’s Chi-difference test.
intercepts were constrained. To solve this problem, one pair of the intercepts was released for both of the scales. After this, the results indicated good invariance; thus, these two scales were partially invariant over time. The model fit indices in different measurement invariance levels can be seen in Table 2.

The $\chi^2$ difference test showed a non-significant $p$-value at the metric invariance level for each tested model, but not at the scalar level, except for the scale Inadequacy in teacher–student interaction (Inad) after releasing one pair of intercepts. The $\chi^2$ test is sensitive for big sample sizes, which can have the effect that some of the $p$-values remain statistically significant (Byrne and Stewart 2006).

Invariance testing enabled the examination of the latent mean differences over time. The mean differences were examined at the scalar level of measurement invariance testing. All of the latent means changed statistically significantly over time.

After the measurement invariance was found to be sufficient for each tested scale, a cross-lagged model was built with constrained models using Mplus (Version 8) and the robust maximum likelihood (MLR) estimator. Cross-lagged panel analysis enables the simultaneous examination of predictions between different variables across time as well as the levels of the means at both time points. The tested model fit the data. The hypothesised relations that were non-significant were removed from the final model. The final model fit estimates were $\chi^2(300, N = 815) = 772.060, p = .000, \text{RMSEA} = .044 \quad (90\% \text{ CI} .040–.048), \text{CFI} = .908, \text{TLI} = .900, \text{and SRMR} = .067$.

**Results**

**Teachers’ sense of professional agency and inadequacy over a five-year period**

The results showed that the primary school teachers experienced high professional agency in the classroom over time (see Table 3). More specifically, teachers’ perceived capacity, i.e. motivation, efficacy, and skills in developing a collaborative learning environment and transforming teaching practices in the classroom with students, was at a relatively high level at the five-year follow-up (Cle1: $M = 5.45$, Cle2: $M = 5.60$). Teachers’ perceived capacity to reflect on their own success in teaching situations and students’ ways of learning in the classroom was an even more recognised mode of

Table 3. Correlations, means, and standard deviations of the observed mean variables used in the study.

<table>
<thead>
<tr>
<th>Variable</th>
<th>1.</th>
<th>2.</th>
<th>3.</th>
<th>4.</th>
<th>5.</th>
<th>6.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. CLE1</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. CLE2</td>
<td>0.62</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. REF1</td>
<td>0.45</td>
<td>0.26</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. REF2</td>
<td>0.38</td>
<td>0.46</td>
<td>0.62</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. INAD1</td>
<td>−0.53</td>
<td>−0.39</td>
<td>−0.16</td>
<td>−0.12</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>6. INAD2</td>
<td>−0.41</td>
<td>−0.53</td>
<td>−0.06</td>
<td>−0.21</td>
<td>0.49</td>
<td>1.00</td>
</tr>
<tr>
<td>N</td>
<td>814</td>
<td>523</td>
<td>814</td>
<td>523</td>
<td>815</td>
<td>522</td>
</tr>
<tr>
<td>M</td>
<td>5.45</td>
<td>5.60</td>
<td>5.88</td>
<td>6.02</td>
<td>2.85</td>
<td>2.58</td>
</tr>
<tr>
<td>SD</td>
<td>0.70</td>
<td>0.65</td>
<td>0.77</td>
<td>0.74</td>
<td>1.25</td>
<td>1.18</td>
</tr>
<tr>
<td>Cronbach’s $\alpha$</td>
<td>0.82</td>
<td>0.81</td>
<td>0.68</td>
<td>0.73</td>
<td>0.73</td>
<td>0.74</td>
</tr>
</tbody>
</table>

The item scale: 1 (completely disagree) – 7 (completely agree).
All correlations were significant at $p < 0.01$.
Paired samples t-test: the mean difference between all pairs (CLE1&CLE2, REF1&REF2, INAD1&INAD2) was statistically significant ($p < .01$).
The results also confirmed that the perceived capacity to transform teaching practice and reflect on one’s own success in teaching situations correlated moderately with each other (rT1 = .45, rT2 = .46), and hence, constituted a teacher’s sense of professional agency in the classroom. This perceived capacity to learn increased statistically significantly over the five-year period (see Table 3).

The results also showed that primary school teachers experienced moderate levels of inadequacy in teacher–student relationships at both time points (Inad1: M = 2.85, Inad2: M = 2.58). In other words, teachers perceived that they had questioned their abilities as teachers or had felt they were totally failing in classroom situations with students infrequently. However, perceived inadequacy in teacher–student interaction decreased over time statistically significantly (see Table 3). Teachers’ sense of inadequate ability in challenging situations with students (INAD) was negatively correlated with constructing collaborative learning environments as well as revising and reflecting on classroom practices (CLE and REF) at both time points (see Table 3).

All the bivariate correlations were in the expected directions, showing that the perceived capacity to construct collaborative learning environments as well as to revise and reflect on classroom practices correlated positively with each other (CLE and REF) and negatively with the sense of inadequate abilities in operating in challenging situations with students (INAD) at both time points (see Table 3).

The dynamic relation between teachers’ sense of professional agency and inadequacy in teacher–student interaction over time

The results showed that the tested cross-lagged panel model fit the data after some modifications (see Figure 2). The results suggest that a teacher’s sense of professional agency is embodied by the two modes of learning, i.e. the perceived

![Figure 2](image-url)
capacity to transform and create collaborative pedagogical practices (CLE) and to monitor and reflect one's own teaching practices (REF). These two items had a relatively strong cross-sectional interrelation at both time points ($ΨT1 = .59$ and $ΨT2 = .68$).

The results also showed that a teacher’s will, efficacy, and skills in learning through reflection and by transforming practices in collaboration with students were strongly predicted by themselves over a five-year period ($β(CLE) = .76; R^2 = .57$ and $β(REF) = .81; R^2 = .66$). Similarly, a teacher’s perceived inadequacy in teacher–student interaction was statistically significantly predictable by itself over time ($β(INAD) = .45$). Consequently, the second hypothesis was confirmed (H2). However, teachers’ perceived capacity to transform teaching practices and reflect their own teaching did not statistically significantly predict each other over time. Thus, the first hypothesis (H1) was confirmed partially.

The results show that a teacher’s tendency to construct a collaborative environment in the classroom and transform practices with students predict lower levels of perceived inadequacy in teacher–student interaction over time ($β = -.31$). On the other hand, it was unexpectedly found that a teacher’s efforts to learn through reflection can even increase teachers’ sense of inadequacy over time. However, the effect was quite weak ($β = .15$) and only nearly statistically significant ($p = .058$). Thus, the third hypothesis (H3) was confirmed only partly. The results indicate that the two modes of teacher learning that constitute a teacher’s sense of professional agency are interrelated with each other, but those two modes may develop and function differently over time, depending on the changing teaching contexts, student groups, and/or perceived and cumulative inadequacy in teaching. Hence, these results indicate that a teacher’s sense of professional agency predicts their capacity to develop teaching practices later in their career, and a teacher’s sense of inadequacy may predict a perceived lack of accomplishment in the future.

Accordingly, the novel result indicates that a teacher’s capacity to transform pedagogical practices and learn collaboratively with students, in particular, seems to prevent a perceived lack of pedagogical skills and inadequacy in their later career. An indicative result was that the perceived tendency to reflect on one’s own success in teaching and collaboration with students may predict an increased risk of experienced inadequacy in teacher–student interaction over time.

However, it is important to note that the model also shows the cross-sectional relations that indicate the expected results, i.e. both components of agency reduce a sense of inadequacy even though the relation between a teacher’s efforts to build a collaborative environment and transform practices and their perceived inadequacy in teacher–student relationships were stronger at both times of measurement. The R2 statistics also show that there are additional factors that predict a teacher’s perceived inadequacy in teacher–student interaction (INAD2: .41).

**Discussion**

This study implies that Finnish primary school teachers have a strong sense of professional agency, and hence, they want, can have, and have skills to learn at work, build collaborative learning environments together with students, modify their teaching practices, and reflect on and evaluate those practices. The study also shows that especially learning
about and creating different learning environments together with students can decrease a perceived inadequacy in teacher–student interaction over time.

**Methodological reflections**

The construct validity of the scales used in this study and the tested model were acceptable (Hu and Bentler 1999; Pietarinen, Pyhältö, and Soini 2016; Soini, Pietarinen, and Pyhältö 2016). However, the scales used in this study have not previously been studied this way in a longitudinal frame. The measurement invariance test showed that the scales reached metric invariance and partial scalar invariance, which was a good basis for a longitudinal structural equation model, i.e. cross-lagged panel analysis. The model fit estimates represented adequate fit for the tested model, and the significant p-value was expected owing to the rather high sample size (Byrne and Stewart 2006).

The response rate at the second time point of measurement was relatively high (64.4%), and the sample represented Finnish primary school teachers well. Thus, the results can be generalised to some extent in the Finnish context. Nevertheless, more research is needed to determine if the scales are consistent in other cultural contexts as well. Despite the study’s limitations, the novel longitudinal results on teachers’ professional agency offer a meaningful contribution to the literature on teacher learning and agency.

**Results in light of previous findings**

Understanding the determinants of teachers’ will, efficacy, and skills in learning is crucial in terms of school development, student learning and achievement, and teachers’ well-being (Brown et al. 2021; Darling-Hammond et al. 2009; Gibbons et al. 2021; Soini, Pietarinen, and Pyhältö 2016; Vermunt and Endedijk 2011). This research aimed at gaining new information about the stability and relations of teachers’ professional agency in terms of learning and perceived inadequacy over a five-year period. Results give new information on how teacher-experienced professional agency in the classroom is related to how competent they feel in the classroom over time and the quality of interaction they are able to construct together with students.

The results show that Finnish primary school teachers perceive strong professional agency in the classroom, which means that they aim at creating collaborative learning environments and transforming their pedagogical practices as well as reflecting on and revisioning their pedagogical practices. Longitudinal analysis additionally showed that teachers’ sense of professional agency also strengthens over time, which is in line with previous research (Heikonen et al. 2020; Lipponen and Kumpulainen 2011; Vermunt and Endedijk 2011). The results showed that the construct of a teacher’s professional agency is rather strong cross-sectionally, and a teacher’s tendency to learn through transforming practices together with students and through reflection is strongly predicted by themselves over time. However, it seems that the two modes of learning that constitute a teacher’s professional agency in the classroom do not contribute to each other but form independent structures over time. The modes of learning that appear as collaborative environment and transformative practice represent a teacher’s will, efficacy, and skills in learning in collaboration with students and are co-regulated in the classroom. On the
other hand, the component of reflection in the classroom refers to the teacher’s self-regulated will, efficacy, and skills in learning by oneself through thinking and reflecting. The context and situation in the classroom, in the workplace, and working conditions may have a greater effect on a teacher’s capacity to create new learning environments and transform practices than reflecting on their work.

The results additionally indicate that primary school teachers’ perceived moderate levels of inadequacy in teacher–student interaction decreased over the five-year period. Previous research reports have varying results on teachers’ perceived inadequacy and burnout, and there is no consensus on the relations between agency and burnout (Maslach, Schaufeli, and Leiter 2001; Pietarinen et al. 2013a, 2013b; Taris et al. 2005). The results show that the mode of collaborative environment and transformative practice, in particular, had a decreasing effect on the sense of inadequacy in teacher–student interaction over time. Whereas the other mode of learning, reflection in the classroom, had a nearly statistically significant increasing effect on a sense of inadequacy in teacher–student interaction over time. The results show that the longitudinal relations between a teacher’s professional agency in the classroom and sense of inadequacy in teacher–student interaction are complex and may also be contradictory. This can mean that teachers experience feelings of inadequacy when they find out that it is not possible for them to modify their teaching in the direction they want. On the other hand, it has also been found that over-reflection on things can also lead to rumination, which can increase the workload and work-related stress (Tuerktorun, Weiher, and Horz 2020).

Practical implications

In order to change school, it is important to understand how teachers change and develop throughout their career (e.g. Kyndt et al. 2016; Toom et al. 2021; Toom, Pyhältö, and Rust 2015; Vermunt and Endedijk 2011). The results are in line with previous research which suggests that it is important for a teacher to also focus on collaborative learning instead of constantly reflecting on their work (Brown et al. 2021; Gibbons et al. 2021). However, a teacher’s strong sense of professional agency is not only the key to well-being and success as a teacher, but also the key to a sense of burden and feelings of inadequacy. Despite the fact that reflection is a valuable and important way of learning for teachers, constant reflection on and thinking about work can increase the sense of insufficient competence in pedagogical practices with students (Tuerktorun, Weiher, and Horz 2020). Although it seems that many Finnish primary school teachers experience strong professional agency in the classroom, it is also important to investigate teachers who experience lower levels of professional agency in the future.

Finnish teacher education has emphasised learning by reflecting, and has seen this as a central factor in teacher learning (e.g. Ojanen 1998; Yost 2006). In light of this research, it is important to focus on collaborative learning together with reflection and on seeing pedagogical practices and teaching situations as places for learning for teachers as well. When teacher–student interaction is seen as a context where everyone can learn together, it can reduce burdening and feelings of inadequacy reciprocally. Focusing on collaborative learning in teacher education can also help early career teachers to face challenges in teacher–student interaction in their first working years (Brown et al. 2021; Gibbons et al. 2021; Toom et al. 2017).
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Notes on contributors

Roosa Yli-Pietilä is a PhD researcher and a university teacher in the Faculty of Education and Culture, Tampere University. Her research interests concern teachers’ professional agency, learning and well-being in the school. Roosa belongs to the research group Learning and Development in School.

Tiina Soini is a research director at the Faculty of Education and Culture, Tampere University and Adjunct Professor at the University of Eastern Finland. Her research interests are in the learning and well-being of educational communities, with a special focus on teacher communities in comprehensive school. She is a Co-PI in the Learning and Development in School research group together with Kirsi Pyhältö and Janne Pietarinen.

Janne Pietarinen is a professor of teacher education at the School of Applied Educational Science and Teacher Education, University of Eastern Finland, and Adjunct Professor at the University of Tampere. His research interests are in educational transitions, pupil and teacher learning, and well-being in the context of sustainable school development. He is Co-PI in the Learning and Development in School research group together with Tiina Soini and Kirsi Pyhältö.

Kirsi Pyhältö is a professor at the Higher Education Center for University Teaching and Learning (HYPE), Faculty of Educational Sciences, Director of HMY-Doctoral School and Extraordinary Professor, Center for Higher and Adult Education, University of Stellenbosch, South Africa. Her research interests include learning and the well-being and professional agency of in-and pre-service teachers. She is a Co-PI in the Learning and Development in School research group together with Tiina Soini and Janne Pietarinen.

ORCID

Roosa Yli-Pietilä http://orcid.org/0000-0003-2543-7279
Tiina Soini http://orcid.org/0000-0002-0637-8931
Janne Pietarinen http://orcid.org/0000-0003-4696-1977
Kirsi Pyhältö http://orcid.org/0000-0002-8766-0559

References


Appendix 1

The scales and items used to explore the relations between teachers’ sense of professional agency in the classroom and sense of inadequacy in teacher–student interaction

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**Scales and items**

**Teachers’ professional agency (TPA) in the classroom**
- Collaborative environment and transformative practice (6 items)
  - Cle1: I’ve been able to build functioning interactive relationships with my students.
  - Cle12: I’m able to create a nice atmosphere together with my students.
  - Cle13: When planning my work I’m able to utilise the feedback I get from my students.
  - Cle14: I can modify my teaching to adjust to different groups of students.
  - Cle15: I’m able to find teaching methods to engage even the most challenging groups of students.
  - Cle16: I’m able to find ways to support the learning processes of all my students.

**Reflection in the classroom (4 items)**
- Ref21: I still want to learn a lot about teaching.
- Ref22: I’d like to understand young people’s ways of thinking and acting better.
- Ref23: I regularly endeavour to estimate my success in teaching situations.
- Ref24: I think we can all learn something in a teaching situation.

**Socio-contextual burnout inventory (STBI)**

**Inadequacy in teacher–student interaction (INAD) (3 items)**
- Inad31: The challenging students make me question my abilities as a teacher.
- Inad32: I often feel I have failed in my work with students.
- Inad33: Dealing with problematic situations considering my students often upsets me.

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*The item scale: completely disagree—1 2 3 4 5 6 7—completely agree.*