

Teachers' Self-efficacy in 14 OECD Countries:  
Teacher, Student Group, School and Leadership Effects.

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## **Abstract**

Going beyond previous studies of Teacher Self-Efficacy (TSE) we investigated the effects of personal characteristics, student group and school contextual features, and leadership effects on teachers' self-efficacy among 44,701 teachers in 2648 schools in 14 OECD countries (in the TALIS 2007 dataset). 88.7% of the variance in TSE resided between teachers, 2.9% between schools, and 8.5% between countries. Going beyond previous single-country studies, we show that students' achievement and SES are relevant internationally. Furthermore, the principal's work experience and the leadership style were significant predictors of TSE, and thus suggest a new direction for research in TSE.

**Key words:** Teacher Self-efficacy; Multilevel Analysis; TALIS

**Word count:** 7657

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## 1 Introduction

Teacher's self-efficacy (TSE), or their "*belief or conviction that they can influence how well students learn, even those who may be difficult or unmotivated*" (Guskey & Passaro, 1994, p. 4), has been researched widely during the last 30 years (Klassen, Tze, Betts, & Gordon, 2010). To summarise, high TSE teachers are more committed to their work (Coladarci, 1992; Glickman & Tamashiro, 1982) and experience less job-related stress (Klassen & Chiu, 2010) than lower TSE teachers. High TSE teachers achieve adaptive student-teacher interaction (Gibson & Dembo, 1984), manage classrooms smoothly (Woolfolk & Hoy, 1990), and their students have relatively higher school performance (Midgley, Feldlaufer, & Eccles, 1989).

A review by Klassen et al. (2010) points out three main characteristics of previous studies on TSE. First, previous studies are single-country studies, most of which have been carried out in the USA (but see Vieluf, Kunter, & Vijver, 2013). Second, previous studies have scarcely taken into account classroom- and school level factors (but see Malmberg, Hagger & Webster, 2014; Pas, Bradshaw & Hershfeldt, 2012). Third, research into the associations between principals' and head-teachers' leadership style and TSE is scarce. Studies in the fields of educational effectiveness and organisational psychology demonstrate the importance of leadership style for the development of a functioning community of teachers in the school as a whole, usually referred to as collective teacher self-efficacy (Goddard, 2002). Pas et al (2012) showed that a collegial leadership style had an effect on individual teachers' TSE. In the present study, we expand previous research in three ways. First, we investigate TSE in 14 countries that belong to the Organisation for Economic Cooperation and Development (OECD), thus broadening the geographical realm of previous research. A single country study has only been carried out in the Flemish part of Belgium

(which is both part of the current data set and the OECD), which shows a positive relationship between maths achievement and teacher beliefs such as TSE (Boonen, Van Damme, & Onghena, 2014).

Second, we take into account teacher, classroom, school level and leadership characteristics as predictors of TSE. The OECD countries subscribe to shared educational aims, by which they aim to promote policies that will improve the economic and social well-being of the people of their member states (OECD, 2013). For the OECD, enhancing educational systems is a major strategy for reaching these goals (OECD, 2011) and teachers are key for implementing such changes in schools, through the leadership of principals.

Therefore, we make use of the Teaching and Learning International Survey (TALIS) dataset, which includes nationally representative data from 44,701 teachers in 2648 schools in 14 OECD countries. Vieluf et al. (2013) demonstrated metric invariance between all 23 countries, when using a single level, multiple group analysis, allowing valid comparisons between TSE, and associations between TSE and other variables across the TALIS countries, but not for the study of mean-level differences between countries. In the present study we chose to focus on the OECD countries, which share certain economic aims and want to foster education development as part of this, and apply appropriate multilevel models to disentangle variability in TSE at the teacher, school and country levels, and account for effects of person (i.e., teacher characteristics), contextual factors (i.e., student groups, school), and leadership at their appropriate levels.

Third, at the school level there are very few existing studies that take into account the influence of principal- and school factors on TSE. Our study allows to close this gap by taking into account features of the school, its environment and the principal as a key figure in creating the work conditions of teachers at school, where TSE is developed.

The TALIS / OECD data provides a rich source of these factors on an international comparative level. As TSE is positively associated with student achievement (Malmberg et al.

2014, Midgley et al. 1989) and classroom climate (Ashton, Doda, & Webb, 1983), is associated with the use of positive strategies of student support (Emmer & Hickman, 1991) and teachers with a high level of TSE tend to cope better with a high workload (Klassen & Chiu, 2010), it makes it an important construct to consider for policy and practice.

## **2 Teacher self-efficacy, its antecedents, correlates and outcomes**

Bandura defined the concept of self-efficacy as the self-perception of “one’s capability to accomplish a given level of performance” (Bandura, 1986, p. 391). With respect to teacher self-efficacy (TSE), Guskey & Passaro (1994) further specified that this concept comprises of the teachers’ belief that they can influence their students’ learning despite facing several obstacles such as a lack of motivation or problem behaviour. Furthermore, research has shown that high TSE teachers have more confidence in their “*capabilities to organize and execute the courses of action required to [...] be successfully capable of teaching, regardless [of] surrounding conditions like SES, parental home or school climate*” (Bandura, 1997, p. 3). Relatively higher TSE teachers believe that they can positively impact student learning despite external influencing factors such as low socioeconomic status, or students' lack of motivation (Tucker et al., 2005). However, in one of the few studies which have included school-level proxies for students' background on TSE, Pas et al. (2012) found no effect of organizational health ratings, student mobility, student suspensions, student enrolment or principal turnover on TSE. Malmberg et al. (2014) found that teachers experience less situation-specific mastery of organising classrooms when teaching classes with a larger proportion of students eligible for free school meals. Vieluf et al. (2013) found 87% of the variance of TSE between teachers, 4% between schools and 8% between countries (all 23 countries in the TALIS study). TSE varies according to personal characteristics, but also according to classroom, school and country characteristics. By comparing aggregated means at the country level, job-satisfaction showed a strong relationship with TSE, as well as in-group collectivism and modesty. Although the bulk of the variance of TSE is between

individual teachers, the school and country level effects on TSE provide an important contribution to our understanding of how learning organisations can influence TSE. In this context it is important to focus on the role of the head-teachers / principals, as they are formally in the position to contribute, both pedagogically and organisationally, to TSE.

### *2.1.1 Teacher-level*

So far, most research on TSE has investigated the teacher level. Chester & Beaudin (1996) found that TSE is mediated by age and prior work experience, which was supported by Cousins et al. (1996). In contrast, a non-linear relationship of TSE and work experience was found by Klassen & Chiu (2010), where TSE first rises until mid-career and then drops. Taking into account the level of preparedness and classroom experience, Giallo & Little (2003) found a positive relationship with TSE, but no effect was found by Ruble et al (2011). Formal teacher training was positively associated with TSE for instruction, whereas positive informal experiences in the classroom, i.e. during studying, were positively related to TSE in student engagement. Furthermore, if pre-service experience is taken into account, this had a long-standing influence on TSE even in late teaching years (Tuchman & Isaacs, 2011). Gender effects on TSE are mixed: While Cousins et al., (1996) found male teachers to have a higher TSE, Coladarci (1992) found female teachers to be higher, but Malmberg et al. (2014) found no gender effect. Furthermore, Klassen & Chiu (2010) show that female teachers tend to report lower TSE in cases of high workload stress and stress with student behaviour. No influence of work experience and academic level on TSE was found by Pas et al. (2012). Over the course of the career, TSE first appeared to rise and then dropped (ibid.). A high workload was also related to a high level of TSE (Klassen & Chiu, 2010). Emmer & Hickman (1991) found a positive relationship between TSE and use of positive strategies of student support. High TSE teachers were more likely to encourage students, introduce peer support, reflect on their own teaching, and use more reductive strategies (e.g. desists, warnings), as well as more positive strategies, in order to achieve or maintain a desirable behaviour. The same was found

for teachers who felt educationally well prepared and anticipated success in the classroom (Cousins et al., 1996; Raudenbush et al. 1992). With respect to science teachers, Kazempour & Sadler (2015) found a positive impact of teacher training programs on both the awareness of own teaching lacks as well as a higher level of TSE. Furthermore, TSE is positively related to teachers' emotional intelligence (Gürol, Özercan, & Yalçın, 2010), but showed a negative relationship with job tension and discontent (Helms-Lorenz & Maulana, 2015). Helms-Lorenz et al (2015) also report a weaker link between classroom SE and job related stress for new teachers than for established ones. Also, more experienced teachers with a higher level of domain-specific TSE reported a higher level of mastery-experience in classroom situations (Malmberg et al., 2014).

### *2.1.2 Classroom effects on TSE*

Concerning the classroom setting, class-size and students' age have a positive effect on TSE (Coladarci, 1992; Raudenbush et al., 1992). Klassen & Chiu (2010) found a relationship between three domains of self-efficacy (instructional strategies, classroom management, and student engagement), two types of job stress (workload and classroom stress) job satisfaction and teacher socio-demographic information. Furthermore, Rimm-Kaufman & Sawyer (2004) reported that more efficacious teachers are more likely to introduce new teaching approaches and stricter classroom management. They also use more instructional teaching strategies (Klassen & Chiu, 2010) and are more likely to create a positive atmosphere (Ashton et al., 1983). Furthermore, teachers reported a stronger belief in student ability if they were younger (Jamil, Downer, & Pianta, 2012). A positive influence of TSE on students' achievement was reported by Malmberg et al. (2014) and Ashton et al. (1983) while the transition from a high to a low TSE teacher appeared to have a negative influence on the students' math achievement (Midgley et al., 1989). Students in classes of more self-efficacious teachers were more engaged in their learning (Guo et al., 2011; Pas et

al., 2012) and, vice versa, teachers with higher TSE were found to better engage students in the lessons (Holzberger et al., 2014).

### *2.1.3 School and leadership effects on TSE*

Following social cognitive theory (Bandura, 1977) the principal's leadership style can be seen as a source of vicarious experience or verbal persuasion. Although there has not been much attention paid to the effect of school leadership on TSE in empirical studies, there is a link to the neighbouring field of school effectiveness that makes it worthwhile to also take this factor into account. Research in school improvement suggests that both instructional and transformational leadership are significantly associated with the school environment in which teachers work (Day & Sammons, 2013). Transformational leadership has shown relationships with vision-based leadership, setting directions for and restructuring the school, setting developmental goals for staff and curriculum and building relationships with the community. Hence, the head teacher develops the school organisation by assuring a collegial and supportive feedback culture, giving teachers freedom to develop their strengths and build strong links with the school environment like parents or officials, but at the same time taking on a protective role so that none of these influences prevail. Instructional leadership, in contrast, has been associated with the setting of educational goals, planning the curriculum and the evaluation of teachers and teaching. In this paradigm, the head teacher focuses on creating an environment for better student achievement, for fostering teaching and learning and their quality. Such organisational-level visions can be implemented by empowering teachers within a school through establishing clear goals for the teachers to commit to, promoting collective responsibility and accountability for student achievement and providing constructive feedback on teaching and learning. At the classroom level key factors which promote student achievement growth are the use of teaching strategies which support student engagement, smooth running of classrooms and promoting higher order thinking among students. As student achievement, student engagement and teachers' mastery experiences are

positively associated (Malmberg et al., 2014), the role of the principal's leadership style in promoting such teaching strategies is crucial. Taken together, the leadership styles conceptualised in the school effectiveness literature fit Bandura's conceptualisation of vicarious experiences and verbal persuasion. Hence, leadership style forms an integral part of school level factors which can promote TSE.

In empirical studies so far, Coladarci et al. (1992) found that TSE was positively related to positive school climate, a small student-teacher ratio as well as a principal's instructional style of leadership. This is supported by Guo et al. (2011), Raudenbush et al. (1992) and Chester & Beaudin (1996) who also showed that staff collaboration is positively connected to high TSE. Furthermore, a supportive and academically accomplished principal, who uses connections with authorities in the teachers' favour and builds a trust- and respectful relationship contributes to a strong sense of general TSE (Hoy & Woolfolk, 1993; Skaalvik & Skaalvik, 2007). The opportunity for teachers to influence decision making (Ashton et al., 1983), as well as a strong emphasis on academic achievement (Hoy & Woolfolk, 1993) have also been linked with high TSE. A positive influence on individual TSE was found for a cooperative relationship with parents (Skaalvik & Skaalvik, 2007). In contrast, student mobility, school enrolment, student suspension rate, free and reduced meals, principal turnover and collegial style of leadership do not seem to affect TSE (Pas et al., 2012). Hipp (1996) distinguished between a transformational style of leadership (the sense that "teachers in general can accomplish things" as defined by Guskey & Passaro, 1994), which has an impact on general TSE, and role model behaviour, which turned out to be positively related to personal TSE. This was supported by Walker & Slear (2011), who additionally accounted for the principal's experience. Furthermore, the mediating role of TSE between an instructional style of leadership and collective self-efficacy was pointed out by Calik et al. (2012), who showed that both features of TSE were positively related to an instructional style of leadership. Taking into account the environment of schools, Knoblauch & Woolfolk Hoy

(2008) showed that TSE increases over time, but less so for teachers who teach in urban areas compared to those who teach in rural or sub-urban ones. Just recently, Holzberger et al.

(2014) found that in schools which cater for their teachers' intrinsic needs (i.e. autonomy or competence) teachers had higher TSE.

Although Bandura's definition of TSE – the teacher's capability to accomplish a given level of performance - includes a variety of possible influencing factors on TSE, - as can be seen above - only very few studies so far include external obstacles such as SES, parental home and school climate in an integrated comprehensive model. Also, the influence of school leadership on TSE still needs further research. This study uses the TALIS data set, which provides a wide range of those factors.

The sense of self-efficacy is hereby nurtured by four different sources: verbal persuasion (e.g. feedback from colleagues or the principal), vicarious experience (e.g., successful behaviour of a role model such as a more senior colleague), mastery experience (e.g., own successful teaching) and emotional arousal (e.g., accelerated heart rate) (Bandura, 1977). With respect to Bandura's sources of TSE, the variables used in this study can be grouped as follows: The left column contains sources of TSE, the right column the variables in the data set: mastery experience (student achievement, classroom activities and teaching practices), vicarious experiences (person-related features of the principal and the principal's style of leadership) and verbal persuasion (student behaviour, classroom climate, school-climate related features, parent-related variables and instructional style of leadership):

[Figure 1 here]

### **3 The Teaching and Learning International Survey (TALIS)**

The data are derived from the Teaching and Learning International Survey (TALIS) survey, an OECD-driven international school- and teacher survey (OECD, 2010). For the OECD, education is one of the major pathways for achieving its aim of wealth growth in its member countries (OECD, 2011). TALIS, which is one of the "Indicators of Education

Systems (INES) projects” follows from the very first (e.g. nursery) to the very last educational experiences a person has (e.g. further education) by conducting large-scale quantitative studies. It is a cross border project that targets teachers and principals in order to compare the effectiveness of schools amongst its member countries. Accordingly, it informs political decision making regarding both teacher education and school development by giving insight into differences between countries and highlighting successful educational systems (OECD, 2009). Altogether, five focus areas (school leadership, appraisal and feedback of the teachers’ work, teachers’ professional development, teachers’ beliefs and attitudes about teaching and their pedagogical practices in the classroom) have been identified to examine school effectiveness. In our study we focus on teachers’ beliefs and attitudes about teaching and their pedagogical practices in the classroom. We chose to include all 14 OECD countries in the TALIS 2008 study as these member countries have already subscribed to these collective educational aims. Partner countries are those which have not yet fully met the policy standards in a wide range of areas, but are close to achieving them and thus are under negotiations with the OECD for becoming full members (OECD, 2014). We focus on the OECD countries, as they have already agreed on common educational aims.

#### **4 Research questions**

The aim of our study is to investigate the effects of teacher, classroom, school and leadership characteristics on teachers’ self-efficacy in 14 OECD countries.

Our research questions are:

1. How much variance is explained at the teacher-, school- and country level?
2. What is the effect of the teachers’ personal characteristics, teaching and classroom-practices on teachers’ self-efficacy?
3. What is the effect of student group characteristics on teachers’ self-efficacy?
4. What is the effect of principal characteristics and practices and school characteristics on teachers’ self-efficacy?

#### **4.1 Hypotheses**

1. More experienced teachers have a relatively higher TSE.
2. Teachers who teach higher performing students have a relatively higher sense of TSE.
3. A warmer and more organised classroom climate is related with relatively higher TSE.
4. An instructional style of leadership of the principal is related with relatively higher TSE.
5. A feedback culture as a source of verbal persuasion contributes positively to TSE.

### **5 Method**

#### **5.1 Sample**

In the initial TALIS-survey, which was carried out from late 2007 to early 2008, 17 out of the 34 OECD-countries (Australia, Austria, Belgium (Flemish Community), Denmark, Hungary, Iceland, Ireland, Italy, Korea, Mexico, Norway, Poland, Portugal, Slovak Republic, Spain, Turkey) took part. In addition, seven ‘partner countries’ (Brazil, Bulgaria, Estonia, Lithuania, Malaysia, Malta, Slovenia) of the OECD participated, but were not included in the present study. Furthermore, data from three OECD countries (the Netherlands, Ireland and Iceland) were excluded by the OECD itself because they did not meet expected quality criteria, as the samples did not meet the relevant response rate of 50%. For the present study we present the raw data for 44,748 teachers, from 2,800 schools in 14 OECD countries, in Table 1. The sample was chosen by applying a two-stage random sampling plan: in each country, 200 secondary schools were sampled. In these schools, 20 teachers who teach 15-year-old students were randomly chosen. Schools with a special focus (e.g., catering for special educational needs) were not taken into account. For the data collection, questionnaires were administered by teachers and principals of the chosen schools. Before the study was carried out, the respective national authorities were consulted for ethical approval of the project.

## 5.2 Measures

We included measures at the teacher- and student group level (Level 1) and the school and leadership level (Level 2). At the country level (Level 3) we investigated whether the teacher, student, school and leadership effects differed across the countries.

### 5.2.1 Teacher self-efficacy

Teachers rated to what extent they agreed with four items: 'I feel that I am making a significant educational difference in the lives of my students', 'If I try really hard, I can make progress with even the most difficult and unmotivated students', 'I am successful with the students in my class' and 'I usually know how to get through to my students', on four point scales (1 = strongly disagree, 4 = strongly agree). As shown in Table 1, for the overall sample the average reliability for the scale was high ( $M_\alpha = 0.76$ ) as well as for the single countries ( $\alpha = 0.67 - 0.82$ ).

We investigated the structural validity of the TSE measure. To do so we carried out 3-level Confirmatory Factor Analysis (CFA), with teachers (level 1), nested in schools (level 2), nested in countries (level 3). We used a Root Mean Square Error of Approximation (RMSEA) and Standardized Root Mean Square Residual (SRMR) for the within and between levels  $\leq 0.05$  for good fit and  $\leq 0.08$  for acceptable fit, and a Tucker-Lewis Index (TLI) and Confirmatory Fit Index (CFI)  $\geq 0.95$  as indices of good and acceptable  $\geq 0.90$  fit. A model in which the factor loadings were allowed to vary across the three levels fitted data well ( $\chi^2_{[6]} = 606.86$ ;  $p < .001$ ;  $RMSEA = 0.047$ ;  $SRMR_{Teacher} = 0.023$ ;  $SRMR_{School} = 0.045$ ;  $SRMR_{Country} = 0.066$ ;  $CFI = 0.986$ ;  $TLI = 0.957$ ). A model in which we tested metric invariance across the levels ( $\chi^2_{[5]} = 691.94$ ;  $p < .001$ ;  $RMSEA = 0.036$ ;  $SRMR_{Teacher} = 0.022$ ;  $SRMR_{School} = 0.095$ ;  $SRMR_{Country} = 0.104$ ;  $CFI = 0.984$ ;  $TLI = 0.976$ ), showed excellent fit except for the school and country specific SRMRs. The model in which the factor loadings are equated provides an equal metric across levels, necessary for investigation of the structural associations. As our

model was fitted across three levels of TSE data, these go beyond previous models of Vieluf et al (2013) and (Klassen et al., 2009) who did not take account of the school level. Consistent with Vieluf et al (2012) and Klassen et al., (2009) our measurement is deemed acceptable for investigation of TSE across teachers, school and countries.

[Table 1 here]

### 5.2.2 Teacher characteristics

On the teacher-level, we included, *gender* (0=male, 1 = female), age, educational level, structure of the school week and work experience. Age was measured on a six-step scale (1 = under 25, 2 = 25-29, 3 = 30-39, 4 = 40-49, 5 = 50-9, 6 = 60+). For assessing the educational level, the ISCED-levels 5, 5A, 5B and 6 classification were used (OECD, 2010) (1 = ISCED 5, 2 = ISCED 5A, 3 = ISCED 5B, 4 = ISCED 6<sup>1</sup>). The structure of the school week was assessed by asking how many hours were used for teaching, planning or administrative tasks using an open-ended format between 0 to 100%. Teachers' work experience was measured using a seven-step scale (1 = 1st year, 2 = 1-2 years, 3 = 2-5 years, 4 = 6-10 years, 5 = 11-15 years, 6 = 16-20 years, 7 = 20+ years).

Teachers reported on three different teaching practices: structuring practices (five items, e.g. I explicitly state my learning goals), student oriented practices (four items, e.g. students work in groups according to their abilities) and enhanced activities (four items, e.g. students hold a debate and argue for a particular point of view that may not be their own.) using a four point likert scale (1 = never or hardly ever, 2 = in about one-quarter of my

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<sup>1</sup> The UNESCO (United Nations Educational, Scientific and Cultural Organisation) has introduced the following internationally used categories for the classification of educational attainment: ISCED (International Standard Classification of Education) (UNESCO, 2012):

- Level 3: Upper secondary education
- Level 4: Post-secondary non-tertiary education
- Level 5A: First stage of tertiary education: vocational training
- Level 5B: First stage of tertiary education: Bachelor & Master
- Level 6: Second stage of tertiary education: Research degree

lessons, 3 = in about one-half of my lessons, 4 = in about three-quarters of my lessons, 5 = in almost every lesson).

### 5.2.3 *Classroom characteristics*

There are six variables concerning the class the teachers were mainly teaching in lower secondary grade: Students' first language, Parents educational level, Classroom size, Students' achievement and Classroom climate. Teachers were asked to report the proportion of students whose first language is different from the language of instruction, of parents whose educational level is 'ISCED 3 or higher' (Vocational Training) (UNESCO, 2012) or 'ISCED 5 or higher' (Short-cycle tertiary education) (ibid.) using five step-scales (1 = > 10%, 2 = 10-20%, 3 = 20-40%, 4 = 40-60%, 5 => 60%). Students' achievement in the target classroom was measured by asking for the degree to which their ability is higher or lower than the average for their age group (1 = much lower, 2 = slightly lower, 3 = average, 4 = slightly higher, 5 = much higher). The classroom size was collected by asking for the actual number of students in the classroom.

The climate in the classroom consisted of a scale of four items, asking if the teacher often has to wait for the students to calm down or if the students themselves are concerned about a pleasant atmosphere in the classroom (four items, e.g.: When the lesson begins, I have to wait quite a long time for students to quiet down,). Again, a four-step Likert scale was used (1 = strongly disagree, 2 = disagree, 3 = agree, 4 = strongly agree). The assessment of a teacher's classroom practices was based on the estimation of what proportion of a lesson, out of 100 %, is spent on administrative tasks, keeping order in the classroom and actual teaching and learning. These were included in the analysis as an interval scale.

### 5.2.4 *Principal and school characteristics*

The background information about the principal, (gender, age, highest level of education and experience as principal) were coded the same way as the teacher questionnaire.

With the exception of gender and school type (which were dummy coded), all variables were treated as continuous ones.

The attitude towards management was assessed by asking how often they engage in different school activities, using a four point-Likert scale (1 = never, 2 = seldom, 3 = quite often, 4 = very often) or to which extent they agree on different statements about school leadership (1 = strongly disagree, 2 = disagree, 3 = agree, 4 = strongly agree) (OECD, 2010). Structural validity was inspected using Principal Component Analysis (OECD, 2010): 1. Framing and communicating the school's goals and the curricular, 2. Promoting instructional improvement and professional development, 3. Supervision of the instruction in the school, 4. Accountability role of the principal, and 5. Bureaucratic rule-following (ibid.). A two-factor solution was suggested, so these five scales were further summarised into two different styles of leadership and management: Administrative leadership (scale 4+5) and Instructional leadership (scale 1,2,3). We also included two measurements to investigate school characteristics: The school type (private = 1, public = 0) and community size, which was represented by the size of the neighbourhood of the school (1=village < 3000 people, 2=small town 3,000 – 15,000 people, 3=town 15,000 – 100,000 people, 4=city 100,000 – 1,000,000 people, 5=big city > 1,000,000 people).

[Table 2 here]

### **5.3 Missing data**

Although only 5.3% of the data points at the individual teacher level were missing, variables had between 0 to 13.3% missing data points. At the between (school) level, 5.9% of data points were missing and variables had between 0 and 13.8% missing data. For this reason we carried out a multiple imputation in MPlus using the Bayesian two-level imputation procedure (Muthén & Muthén, 2012). The five resulting datasets were analysed in MLWin and model results were combined using Rubin's framework (Rubin & Little, 2002). The final dataset to analyse included 44,701 teachers in 2648 schools in 14 countries.

#### 5.4 Analytic procedures

As the data were hierarchically structured we specified multilevel models with teachers (i) nested in schools (j) nested in countries (k) in the following steps. In order to answer the first research question – how much variance is accounted for by teachers, schools and countries -, at first (Model 0), a three-level baseline-model (variance components model) without predictors was estimated (equation 0).

$$TSE_{ijk} = \beta_0 + v_{0k} + u_{0jk} + e_{0ijk} \quad (0)$$

where  $\beta_0$  is the grand intercept,  $v_{0k}$  the country level residual (i.e., how does TSE in a particular country deviate from the grand average TSE),  $u_{0jk}$  the teacher level residual (i.e. how does the school-average of TSE deviate from the country average) and  $e_{0ijk}$  the teacher level residual.

In order to answer the second research question, in Model 1 the teacher-related variables were introduced: gender (*tgend*), educational level (*tedulev*), teaching experience (*tteaex*) and teaching practices (equation 1). All variables - in this as well as the following models - were grand mean centred.

$$TSE_{ijk} = \beta_0 + \beta_1 tge_{ijk} + \beta_2 tgend_{ijk} + \beta_3 tedulev_{ijk} + \beta_4 tteaex_{ijk} + v_{0k} + u_{0jk} + e_{0ijk} \quad (1)$$

In order to answer the third research question, in the second model, the classroom information was added: class size, classroom climate, student achievement, classroom practices (teaching and learning, keeping order, administrative tasks), % of students with a mother tongue different from the language of instruction (*diff lang*) and the socio-economic background measured by the educational level of the parents' (> isced 3, > isced 5) (equation 2) in the target class.

$$TSE_{ijk} = \beta_0 + \beta_{1-4} teacher_{ijk} + \beta_5 thrstach_{ijk} + \beta_6 hrsplan_{ijk}$$

$$\begin{aligned}
 & +\beta_7hrsadmin_{ijk} + \beta_8tstrucact_{ijk} + \beta_9tstudoract_{ijk} + \beta_{10}tenhact_{ijk} + \beta_{11}clrize_{ijk} + \\
 & \beta_{12}crclima_{ijk} + \beta_{13}studach_{ijk} + \beta_{14}tealearn_{ijk} + \beta_{15}keeporder_{ijk} + \\
 & \beta_{16}admintasks_{ijk} + \beta_{17}diffalang_{ijk} + \beta_{18}parisced3_{ijk} + \beta_{19}parisced5_{ijk} + v_{0k} + \\
 & u_{0jk} + e_{0ijk} \quad (2)
 \end{aligned}$$

Models 3 and 4 contain variables on the school level. In Model 3, principal-related variables were added: gender, age, work experience and style of leadership. Model 4 additionally contains information about the school environment: whether the school is public or private, and the area in which it is located.

The full analytical model with both level 1 and level 2 variables is represented in equation 3:

$$\begin{aligned}
 TSE_{ijk} = & \beta_0 + \beta_{1-4}teacher\ characteristics + \\
 & \beta_{5-19}classroom\ characteristics + \beta_{20}pgend_{jk} + \beta_{21}page_{jk} + \beta_{22}pedulev_{jk} + \\
 & \beta_{23}pworkexp_{jk} + \beta_{24}ppedlead_{jk} + \beta_{25}padminlead_{jk} + \beta_{26}pgend_{jk} + \\
 & \beta_{27}studenrol_{jk} + \beta_{28}schooltype_{jk} + \beta_{29}comsize_{jk} + v_{0k} + u_{0jk} + e_{0ijk} \quad (3)
 \end{aligned}$$

The random effects are the same as for the previous models.

We calculated explained variances according to Hox (1995). Effect sizes were calculated using recommendations by Marsh et al. (2009).<sup>2</sup>

## 6 Results

[Table 3 here]

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<sup>2</sup> ES = (2 × B × SD<sub>predictor</sub>) / ψ, where B is the unstandardised regression coefficient in the MLM, SD<sub>predictor</sub> is the standard deviation of the predictor variable at Level 2, and ψ the total variance of the dependent variable.

## 6.1 Variance in TSE between teachers, schools and countries

Our baseline model (Model 0) showed that 88.7% of the variance in TSE resided between teachers, 2.9% between schools, and 8.5% between countries.

## 6.2 Research Question 1: Teacher characteristics as predictors of TSE

In Model 1 we included teacher characteristics, improving model fit ( $\Delta -2LL = 2,738$ ;  $p < .001$ ). As shown in Table 2, Teacher characteristics explained 15.8% of the variance of TSE at the teacher level, 20% on the school level and 12.2% on the country level. Male teachers felt more self-efficacious than female teachers ( $B = 0.010$   $p < .05$ ,  $ES = 0.055$ ). More experienced teachers had a higher TSE ( $B = 0.004$   $p < .01$ ,  $ES = 0.079$ ) as well as teachers who structured their activities ( $B = 0.035$   $p < .001$ ,  $ES = 0.371$ ), used student-oriented activities ( $B = 0.062$   $p < .001$ ,  $ES = 0.634$ ) and used enhancing activities ( $B = 0.050$   $p < .001$ ,  $ES = 0.459$ ).

## 6.3 School characteristics

In the second model, classroom variables were added and the model fit improved ( $\Delta -2LL = 1,956$ ;  $p < .001$ ). This explained 9.2% variance at the teacher level, 40% at the country level and 25.7% at the school level. All previously significant variables remained so; except of the influence of teaching experience, which dropped. The newly added variables included four which had a significant impact on TSE: Student Achievement ( $B = 0.033$ ,  $p < .001$ ,  $ES = 0.327$ ), Different Mother Tongue ( $B = 0.004$ ,  $p < .01$ ,  $ES = 0.059$ ), Parents' educational level > ISCED 3 ( $B = 0.006$ ,  $p < .01$ ,  $ES = 0.089$ ) and Parents' educational level > ISCED 5 ( $B = 0.010$ ,  $p < .001$ ,  $ES = 0.155$ ). These variables contributed to explaining more variance on each level than the previous one: 14.1% at the teacher level, 0.4% at the school level and 1.3% at the country level.

In the third model, we added variables at the school level containing information about the principal. This improved model fit ( $\Delta -2LL = 52$ ;  $p < .001$ ). On the teacher level, male teachers still had a higher score of TSE and Structuring and Enhancing Activities remained a

significant influencing factor, but not Student-oriented Activities ( $B = 0.062, p < .001, ES = 0.634$ ). For the classroom context, only the Parents' educational level  $>$  ISCED 5 ( $B = 0.010, p < .001, ES = 0.171$ ) rose, whereas all other previously added factors remained unchanged. From the newly added variables, only the principal's work experience ( $B = 0.004, p < 0.1, ES = 0.098$ ) and Instructional Style of Leadership ( $B = 0.029, p < 0.001, ES = 0.125$ ) had a significant positive influence on TSE. The explained variance remained unchanged on the teacher level (14.1%) and on the school level (0.3%) but shrunk on the country level (1%).

In the fourth and last model, variables about the school area were added ( $\Delta -2LL = 7; p < .001$ ) and both the ICC teacher-school and the ICC school-country remained 2.1%, resp. 76.9%. Teachers who taught at a private school had relatively higher TSE than those at a public school ( $B = 0.038, p < .001, ES = 0.168$ ). Here, the explained variance on each level remained unchanged despite the newly added variables.

## 7 Discussion

In this study, we investigated to what extent teachers' self-efficacy is predicted by teachers' personal characteristics, teaching and classroom-practices, classroom and student group characteristics, school principal characteristics and practices, and school characteristics as sources of TSE as proposed in Bandura's theory of self-efficacy (see Figure 1): mastery experience (student achievement, classroom activities and teaching practices), vicarious experiences (person-related features of the principal and the principal's style of leadership) and verbal persuasion (student behaviour, classroom climate, school-climate related features, parent-related variables and instructional style of leadership). We contribute to research in TSE in the following ways: first, this is the first comparison of OECD countries (but see Vieluf et al., 2013). Up to now, most studies on TSE have been carried out in North America so for many countries no data on teacher self-efficacy has been available. Second, we take into account the multilevel structure in which TSE develops by analysing influencing factors

on the teacher, school and leadership and country level. Third, at the school level there are very few existing studies that take into account the influence of principal- and school factors on TSE.

### **7.1 Measurement and variance components of teacher self-efficacy**

The measure of TSE used in the TALIS study is a general personal teacher self-efficacy, indicative of human agency (Bandura, 2008), items modified from original instruments (RAND (1976), Webb (1986), Barth (1990), Tschannen-Moran, Wolfolk-Hoy & Hoy (1998)). Appropriate 3-level CFA models showed that the four-item TSE measure fitted excellently at the teacher-level. A stricter model in which the factor loadings were constrained across the teacher, school and country levels fitted data less well at the school and country levels, possibly suggesting different meaning of individual, school and country level of TSE in line with Vieluf et al (2012) .

Consistent with Vieluf et al (2012) we found the largest proportion of variance between teachers (88.7%), then between countries 8.5% and least between schools (2.9%). The small proportion variance of TSE between schools (i.e., school-level TSE) is of the same magnitude as the typically small proportions of variance found at the school level for motivational constructs like students' engagement and motivation (Martin, Malmberg, & Liem, 2010). Although small in magnitude the variance proportion still constitutes an important part of overall functioning of the school.

### **7.2 Personal characteristics**

In the first step of analyses we included teacher characteristics. We found a positive effect of the teachers' gender (males higher): female teachers in general report a higher level of TSE (Apple & Jungck, 1990), but male teachers report higher classroom-management SE (Klassen & Chiu, 2010). The scale which is currently mostly agreed on today is that by Tschannen-Moran & Hoy (2001), which embraces the following three dimensions: 'engaging students', 'organising the classroom', and 'cognitive support'. Here it can be assumed that

differences are due to the international framework of the study as it includes samples that, for example, differ culturally, economically or politically, whereas many existing results come from an American school context, so give insight mostly into the American context but no international generalisation can be derived from these studies. Further investigation is needed into the effect of country on TSE, by including indicators that provide information on these on the country level. The positive influence of teaching experience on TSE, again, partly supports our hypothesis (Hypothesis 1): several studies found by comparing novice and experienced teachers, the years of teaching experience, that TSE first rises, but then declines at a later stages of the career (e.g. Cousins et al., 1996; Wolters & Daugherty, 2007).

However, there are also contrary results in previous research: Guskey (1988) and Tschannen-Moran & Hoy (2007) found that work experience does not have a significant impact on TSE. However, all these results are based on cross-sectional studies, so future research might benefit from longitudinal studies that take into account changes over time as well as provide explanations. Also, since this is the first international comparison of TSE in 14 countries, this result might be due to the international focus of the study, and the answer might lie in between-country differences. Vieluf et al (2013) included country-level correlates of TSE.

### **7.3 Classroom characteristics**

In line with our second hypothesis, we found that teaching in a higher performing class is associated with relatively higher TSE. Accordingly, this result has been replicated on an international scale (Vieluf et al., 2013). The results show that teachers who spend more time on various classroom activities (e.g. structuring, enhancing or student oriented ones), have a higher sense of self-efficacy than those who spent less. Previous research has shown (c.f. e.g. Gabriele & Joram, 2007) that a high sense of TSE is correlated with the use of a broader variety of teaching practices that require a greater flexibility from the teacher. One possible explanation is that more efficacious teachers are more willing to explore different instructional styles than those with a lower TSE. However, classroom characteristics also

significantly predict TSE in this model, which has also been shown in previous research (Ashton & Webb, 1986; Midgley et al., 1989). Teachers with a higher level of TSE are more likely to take individual student differences into account and adjust their teaching accordingly. This use of various classroom activities is associated with teachers sense of efficacy. Therefore, further research on the exact mechanisms of this relationship would be useful.

One interesting finding in this model is that teachers' work-experience did not significantly predict TSE, once the classroom-variables were added. One possible explanation could be that the teachers' situation specific TSE varies from one student group to the other. Therefore, future research could investigate, which mediating effects of features such as classroom-climate, student-achievement (c.f. Ashton & Webb, 1986; Bandura, 1997) or the parents' educational level have on the influence of work experience on TSE. This finding highlights the importance of context in which TSE develops. Following Bandura's four sources of TSE, an explanation might be that teachers interpret high student achievement as a source of mastery experience, as it provides them with information about failure or success on their teaching.

#### **7.4 School- and principal characteristics**

In terms of principal characteristics, work experience of the principal, was found to be a significant predictor of TSE. In line with Bandura's sources of TSE, it can be seen as a source of vicarious experience, as an experienced principal might support teachers well by performing role model behaviour and providing guidance.

The instructional leadership style, which has been identified as an important factor contributing to several aspects of TSE (c.f. Calik et al., 2012), did become significant in this model and so supports previous research. According to Bandura (1997), this can be classified as a source of verbal persuasion as its features consist of a continuous feedback-culture. On the other hand, as it also focuses on the principal's teaching and educational goal setting, it

might be a source of vicarious experience that provides teachers with a role model of good teaching. This is in line with the result that also the work experience of the principal is an important factor for a higher level of TSE, as more experienced principals might be able to promote the use of various teaching strategies (see result on the teacher level) than rather inexperienced principals are. This has been reported by Hipp (1996), who found that transformational leadership behaviour is associated with general TSE, whereas role model behaviour and a reward system were related to personal TSE. Walker & Slear (2011) came to the same conclusion that the TSE is associated with the principal's behaviour, but took into account different stages of teaching experience. Another type of research has shown that relatively high TSE is also related to leadership responsibility of the teacher, and not only the leadership style of the principle. It would be interesting to also take this into account this on an international level.

Another finding of the present study was that student achievement and TSE are strongly linked with one another. This supports the results of other studies well. Goddard et al. (2004) argue that collective TSE was positively associated with mastery experience, but negatively related to a school's socio-economic status, which can be interpreted as an contextual effect. Furthermore, it remained a significant predictor for student achievement once school factors were taken into account. Thus, it seems to help to overcome other obstacles the schools face. Here it might be interesting to further analyse the effect of belonging to a particular country on TSE.

In the last model, information about the school-environment was added to the analysis. It appeared that teachers in private schools feel more efficacious than teachers in public school, which is consistent with previous studies (Woolfolk et al., 1990). Private schools are often carefully chosen by parents who are highly educated, who are more affluent, and who also want to achieve a good education for their children as well. Thus, this might be an effect over and above the parental educational level.

It would be interesting for further research to include country-level variables as well. This would contribute to a deeper understanding of the cultural context in which TSE develops, and especially inform decision-making in the OECD as a realm that aims to overcome future challenges through educational improvement.

## **8 Practical implications**

From this research, however, practical implications for teacher training, education politics and also the principal's behaviour can be drawn.

As more self-efficacious teachers seem to experience more mastery in supporting students' learning (Malmberg et al., 2014), teacher training should focus on theoretical underpinnings of such practices (e.g., autonomy support) as well as guided practice for the use of them. This includes support and training at various stages: In a first step, new teachers could shadow experienced teachers and learn from them as role models and their lesson design and behaviour. Then, in a second step, those experienced teachers could work as mentors for the new teachers and provide feedback on their use of teaching methods (Rimm-Kaufman & Sawyer 2004). So both, passive observation and active as well as self-reflective use of various teaching methods could effectively be combined (Cousins et al., 1996; Kazempour & Sadler 2015; Raudenbush et al. 1992).

Another implication can be drawn from the importance the leadership style has shown in relation to TSE: Instructional leadership style is strongly shaped by the principal's role model behaviour, clear goal setting and promoting student outcomes. So if the principal aims at fostering self-efficacy in the teachers, it might be important to establish a strong feedback culture that makes clear the teachers' contribution to the aims of the school and re-assures them of the quality of their teaching (Hoy & Woolfolk, 1993; Skaalvik & Skaalvik, 2007). In association with this, the principal could provide special support for those teachers who teach students with a low SES and take care of the particular needs of a more challenging work environment. Here also the importance of educational politics ties in: To achieve this, both the

principal and teacher need freedom to make their own decisions (Ashton et al., 1983; Holzberger et al. 2014). To provide teachers with extra-support for low SES students, principals need financial and decision making authority, which have to be granted by national or local authorities. In the same way, easy access to professional development is necessary so teachers can grow in their experience and react towards their own educational needs.

## **9 Limitations**

Some limitations of the study are apparent. First, the TSE measure in the TALIS 2008 database comprises of four items representing a general measure of TSE. It would be valuable to carry out replications of the current study in the TALIS 2013 database, where three subscales of the TSE are included. Second, the original focus of the study, as proposed by the OECD, is on education as a means for economic development. This in itself is not a direct limitation, but it might be helpful to bear in mind the original purpose of the study.

## **10 Conclusion**

One interesting result is that the group of teachers seems to be very heterogeneous, so that country-differences are smaller than differences between teachers, but larger than differences between schools. This would support the idea that findings on TSE in a North American context are relevant in international contexts. A second is, this study builds on TSE research by showing effects of principal characteristics on TSE. This appears true across countries. Another finding is that most of the unexplained variance is between schools. Therefore, the differences that occur between schools still seem to be a 'black box' that needs more research attention.

In terms of the scope of the OECD countries it can be said that they are - despite their shared aims and values - still very different, which is especially displayed in the results on the country level. Although the explained variances could be improved by adding explanatory factors, there are none which explain the differences among the countries themselves.

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Table captions

Figure 1 Sources of Teacher Self-Efficacy

Table 1 Teacher self-efficacy in 14 OECD countries

Table 2 Descriptive Statistics

Table 3 Teacher self-efficacy predicted by teacher, classroom, principal and school factors

## OECD Teachers' self-efficacy

Figure 1 Sources of Teacher Self-Efficacy

Sources of SE	Variable
Mastery Experience	<ul style="list-style-type: none"> <li>• Student achievement</li> <li>• Classroom activities</li> <li>• Teaching practices</li> </ul>
Vicarious Experience	<ul style="list-style-type: none"> <li>• Person-related features of the principal</li> <li>• The principal's style of leadership</li> </ul>
Emotional Arousal	<ul style="list-style-type: none"> <li>• ---</li> </ul>
Verbal Persuasion	<ul style="list-style-type: none"> <li>• Student behaviour</li> <li>• Classroom climate</li> <li>• School-climate related features</li> <li>• Parent-related variables</li> <li>• Instructional style of leadership</li> </ul>

Table 1 Teacher self-efficacy in 14 OECD countries

Country	$\alpha$	Mean (SD)	n	%
Australia	0.82	3.18 (0.44)	2148	5.02%
Austria	0.75	3.16 (0.44)	4047	9.47%
Belgium (Flemish Community)	0.80	3.11 (0.40)	3317	7.76%
Denmark	0.80	3.18 (0.45)	1656	3.87%
Hungary	0.67	2.99 (0.37)	2790	3.00%
Italy	0.77	3.19 (0.38)	5021	11.74%
Korea	0.74	2.94 (0.38)	2848	6.66%
Mexico	0.73	3.29 (0.41)	3302	7.72%
Norway	0.72	3.42 (0.42)	2303	5.39%
Poland	0.72	3.07 (0.35)	3080	7.20%
Portugal	0.68	2.95 (0.40)	2937	6.87%
Slovak Republic	0.70	3.04 (0.32)	3037	7.10%
Spain	0.72	2.95 (0.40)	3192	7.47%
Turkey	0.80	3.19 (0.47)	3079	7.20%
Total	0.76	3.13 (0.42)	42757	96.47%

## OECD Teachers' self-efficacy

Table 2 Descriptive Statistics

Teacher	M/%	SE (M)	SD	n	$\alpha$	$\alpha$ min/max
Gender (0 =male, 1 = female)	67.09 % female 32.91 % male			44711		
Educational Level	3.48	0.00	0.77	42741		
Teaching Experience	5.28	0.01	1.74	44315		
Hours Teaching	18,09	0.03	6.58	42465		
Hours Planning	10.62	0.03	6.67	41530		
Hours Administrative Work	4.64	0.03	5.43	39408		
Structuring Activities	3.53	0.00	0.93	40416	0.65	0.51 - 0.76
Student-oriented. Activities	2.39	0.00	0.90	40888	0.68	0.48 - 0.76
Enhancing Activities	1.90	0.00	0.80	39405	0.69	0.57 - 0.82
<b>Classroom</b>						
Class size	24.22	0.05	10.08	42675		
Classroom Climate	2.90	0.00	0.65	42327	0.84	0.70 - 0.88
Student Achievement	3.16	0.00	0.87	42410		
Teaching and Learning (% time)	78.27	0.07	1.45	41255		
Keeping Order (% time)	13.13	0.06	1.14	41300		
Admin. Tasks (% time)	8.47	0.04	7.18	41363		
Different Language %	1.57	0.01	1.17	38739		
Parents < ISCED 3 %	3.43	0.01	1.40	49146		
Parents < ISCED 5 %	2.42	0.01	1.36	39860		
<b>Principal</b>						
Gender ( 0 = male, 1= female)	43.7 % female, 52.0 % male			2517		
Age	2.73	0.00	0.78	2524		
Educational Level	3.23	0.00	0.81	2522		
Work Experience	4.01	0.01	1.71	2522		
Pedagogical Leadership	3.12	0.00	0.36	2518	0.83	0.72 - 0.86

## OECD Teachers' self-efficacy

Administrative Leadership	3.26	0.00	0.38	2513	0.76	0.51 -0.82
Student Enrolment	671.60	2351.00	465.24	2321		
Type of School (0 = public, 1 = private)	16.5 % private, 78.5 % public			2495		
Community Size	2.99	0.01	1.22	2514		

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# OECD Teachers' self-efficacy

Table 3 Teacher self-efficacy predicted by teacher, classroom, principal and school factors

	Model 0	S.E.	p	Model 1	S.E.	p	Model 2	S.E.	p	Model 3	S.E.	p	Model 4	S.E.	p
Fixed Part															
Intercept	3.122	0.004	***	3.119	0.004	***	3.119	0.003	***	3.116	0.005	***	3.108	0.005	***
<b>Teacher</b>															
Gender (0 = male, 1 = female)				0.010	0.004	*	0.008	0.004	*	0.008	0.004	*	0.008	0.004	*
Educational Level				-0.014	0.003		-0.017	0.003		-0.013	0.003		-0.013	0.003	
Teaching Experience				0.004	0.001	***	-0.002	0.001		-0.002	0.001		-0.002	0.001	
Hours Teaching				0.000	0.000		0.000	0.000		0.000	0.000		0.000	0.000	
Hours Planning				0.001	0.000		0.001	0.000		0.001	0.000		0.001	0.000	
Hours Administrative Work				0.003	0.000		0.002	0.000		0.002	0.000		0.002	0.000	
Structuring Activities				0.035	0.002	***	0.029	0.002	***	0.029	0.002	***	0.029	0.002	***
Student-oriented. Activities				0.062	0.003	***	0.063	0.003	***	0.062	0.003	***	0.062	0.003	***
Enhancing Activities				0.050	0.003	***	0.050	0.003	***	0.050	0.003	***	0.050	0.003	***
<b>Classroom</b>															
Class size							0.000	0.000		0.000	0.000		0.001	0.000	
Classroom Climate							-0.105	0.005		-0.104	0.005		-0.102	0.005	
Student Achievement							0.033	0.002	***	0.033	0.002	***	0.033	0.002	***
Teaching and Learning (% time)							-0.001	0.002		-0.001	0.002		-0.001	0.002	
Keeping Order (% time)							-0.003	0.002		-0.003	0.002		-0.004	0.002	
Administrative Tasks (% time)							-0.001	0.002		-0.001	0.002		-0.001	0.002	
Different Language (% students)							0.004	0.002	*	0.004	0.002	*	0.005	0.002	*
Parents < ISCED 3 (% students)							0.006	0.002	**	0.006	0.002	**	0.006	0.002	**
Parents < ISCED 5 (% students)							0.010	0.002	***	0.011	0.002	***	0.009	0.002	***
<b>Principal</b>															
Gender (0 = male, 1 = female)										0.004	0.006		0.006	0.006	
Age										0.002	0.004		0.004	0.004	
Educational Level										-0.020	0.004		-0.018	0.004	
Work Experience										0.004	0.002	*	0.005	0.002	*
Instructional Leadership										0.029	0.009	**	0.034	0.009	***
Administrative Leadership										-0.001	0.009		-0.005	0.009	
Student Enrolment													0.000	0.000	

## OECD Teachers' self-efficacy

Type of School (0 = public, 1 = private)

0.038 0.008 \*\*\*

Community Size

-0.003 0.003

### Random Part

Country	0.015	0.001	***	0.013	0.001	***	0.011	0.001	***	0.010	0.001	***	0.010	0.001	***
School	0.005	0.001	***	0.004	0.001	***	0.003	0.001	**	0.003	0.001	**	0.003	0.001	**
Teacher	0.155	0.001	***	0.146	0.001	***	0.141	0.001	***	0.141	0.001	***	0.141	0.001	***
-2*loglikelihood:	46,325			43,587			41,631			41,579			41,572		
$\Delta$ -2*loglikelihood				-2,738		***	-1,956		***	-52		***	-7		***
% Variance	Variance Proportions			Explained Variance			Explained Variance			Explained Variance			Explained Variance		
Country	0.085			0.122			0.257			0.324			0.324		
School	0.029			0.200			0.400			0.400			0.400		
Teacher	0.887			0.058			0.092			0.092			0.092		

Note: All continuous predictors were grand-mean centred