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EXAMINING SCHOOL CONTEXT AND ITS INFLUENCE ON TEACHERS: LINKING TALIS 2013 WITH PISA 2012 STUDENT DATA

Education Working Paper No. 115

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Abstract

The Organisation for Economic Cooperation and Development (OECD) has linked data from the Teaching and Learning International Survey (TALIS) of teachers of 15-year-old students with school-level data from the Programme for International Student Assessment (PISA), a survey of 15-year-old students. The purpose of this study is to present an exploratory analysis of the combined TALIS-PISA data by examining the relationship of school-level student measures to teacher outcomes. In other words, this paper examines how student factors in a school may influence teachers' work, their attitudes, and their perceived needs for support. Survey responses were collected from teachers and students in eight countries. Data from 26 610 teachers were combined with student measures, aggregated by school, from 103 077 students.

Regression, hierarchical linear and multilevel models were used to analyse the data. Teacher outcomes that were modelled included professional development, collaboration, and self-efficacy. Student measures included attitudes about math and school, PISA math achievement, and Economic, Social and Cultural Status (ESCS). Interactions involving teacher measures such as gender and years of experience crossed with student outcomes were examined. Separate models for mathematics teachers were also explored. Findings varied dramatically across countries, and many significant differences were found between male and female teachers as well as between mathematics and all teachers. The paper concludes with practical implications of the research.

Résumé

L'Organisation de Coopération et de Développement Économiques (OCDE) a rapproché les données de l'Enquête internationale sur l'enseignement et l'apprentissage (TALIS), menée auprès d'enseignants ayant des élèves de 15 ans, de celles recueillies dans les établissements auprès d'élèves âgés de 15 ans dans le cadre du Programme international pour le suivi des acquis des élèves (PISA). Cette étude a pour but de présenter une analyse exploratoire des données combinées de TALIS-PISA en examinant le lien qui existe entre les réponses des élèves au niveau des établissements et celles des enseignants. En d'autres termes, le présent document examine comment les facteurs liés aux élèves dans un établissement peuvent influencer la pratique professionnelle des enseignants, leurs attitudes et l'aide dont ils estiment avoir besoin. Les réponses aux enquêtes ont été recueillies auprès d'enseignants et d'élèves dans huit pays. Les données relatives à 26 610 enseignants ont été associées aux réponses fournies par 103 077 élèves et regroupées par établissement.

Des modèles de régression, des modèles linéaires hiérarchiques et des modèles multiniveaux ont été utilisés pour analyser les données. Parmi les indices des enseignants qui ont été modélisés figuraient le développement professionnel, la collaboration et l'efficacité personnelle. Les indices des élèves portaient notamment sur les attitudes vis-à-vis des mathématiques et de l'école, les résultats PISA en mathématiques, et le statut économique, social et culturel (SESC). Ont également été examinées les interactions entre les données relatives aux enseignants, comme le sexe et les années d'expérience, et les résultats des élèves. Des modèles distincts pour les professeurs de mathématiques ont également été étudiés. Les résultats étaient très différents d'un pays à l'autre, et de nombreux écarts importants ont été observés entre les enseignants et les enseignantes mais aussi entre les professeurs de mathématiques et les autres. Pour conclure, le document expose les implications pratiques de ces travaux de recherche.

TABLE OF CONTENTS

Tables

Figures

Boxes

SECTION 1: INTRODUCTION

What is TALIS?

The OECD Teaching and Learning International Survey (TALIS) is an international, large-scale survey that focuses on the working conditions of teachers and the learning environment in schools. TALIS aims to provide valid, timely and comparable information to help countries review and define policies for developing a high-quality teaching profession. It is a collaborative effort between participating countries, the OECD, an international research consortium, social partners and the European Commission.

TALIS examines the ways in which teachers' work is recognised, appraised and rewarded. TALIS assesses the degree to which teachers' professional-development needs are being met. The study provides insights into the beliefs and attitudes about teaching that teachers bring to the classroom and the pedagogical practices that they adopt. TALIS also describes the role of school leaders and examines the support that they give their teachers. Finally, TALIS examines the extent to which certain factors may relate to teachers' feelings of job satisfaction and self-efficacy.

In TALIS 2013, eight countries opted to conduct the survey in schools that participated in the 2012 Programme for International Student Assessment (PISA) through an option that is referred to as the TALIS-PISA link. This option enables a linkage to be performed at the school level between the information gathered by teachers and principals in TALIS and by students in PISA. The countries that opted to survey this population are Australia, Finland, Latvia, Mexico, Portugal, Romania, Singapore and Spain. More information about the main TALIS 2013 study can be found at www.oecd.org/talis and in the initial international report and supporting documentation (OECD, 2014b; 2014c)

The purpose of the TALIS-PISA link

TALIS provides insight into the backgrounds, beliefs and practices of teachers through data collected from teachers and their school principals. The TALIS 2013 Results: An International Perspective on Teaching and Learning (OECD, 2014b) presented many interesting findings about teachers in lower-secondary schools in the participating countries. This information alone is both thought-provoking and useful for policymakers, school leaders and teachers themselves, and many implications for policy and practice can be extrapolated from the findings presented in this report. But how might the discussion about teaching, learning and schools change if another perspective is added to the conversation: specifically the perspective of students?

PISA data provide insights into the backgrounds, beliefs, attitudes and cognitive outcomes of students. The data collected by PISA, including an assessment of student outcomes and a survey of students, can be used to provide further contextual information for the data collected in TALIS. PISA includes valuable information on students' socio-economic background, their performance, and their views on the school climate and learning environment. These variables provide valuable information about the characteristics of the student body in schools where teachers work and thus represent important aspects of teachers' working environment.

PISA data allow exploration of questions about the relationship between these student factors in the school and teachers' reports of their experiences. Teaching and learning conditions, or the working conditions of teachers, are affected by the characteristics of students in their schools as well as by their attitudes, behaviours and motivations. These data can complement the other school-level data provided by teachers and school leaders in TALIS. The analysis and policy insights drawn from TALIS will be strengthened by adding information collected from students. This new set of data enables examination of relationships between student characteristics and teacher characteristics such as:

- Teachers' needs for professional development. The analyses will investigate whether in schools with high student outcomes on the PISA assessment, teachers report higher or lower needs for professional development.

- Teachers' beliefs about teaching and learning and teaching practices. The analyses will investigate whether teachers' beliefs about teaching and learning and their teaching practices vary in: a) high-performing or low-performing schools; and b) schools with different percentages of students from lower socio-economic backgrounds in the school.

Finally, because PISA 2012 had an emphasis on mathematics and because countries participating in the TALIS-PISA link offered a special questionnaire to mathematics teachers in these schools, an exploration of these aspects for mathematics teachers and students is provided. (See the next section for further information on the administration of the TALIS-PISA link.)

TALIS-PISA link in practice

The eight countries and economies participating in the TALIS-PISA link option were first asked to adhere to specific sampling guidelines in order to select the schools and teachers to participate in the study. For the PISA-TALIS link, 150 schools per country were surveyed, with a sample of 20 teachers in each school in addition to all the mathematics teachers in each school and the school principal. Further details on the sample for all target populations can be found in the TALIS 2013 Technical Report (OECD, 2014c). The international sampling guidelines and other operational parameters applied for the TALIS-PISA link are shown in Box 1.

Box 1. The TALIS-PISA link design

International target population: The set of classroom teachers* who teach "PISA-eligible"** students in schools that participated in PISA 2012.

Target sample size: 150 schools per country; 1 school leader and 20 teachers in each school with all the eligible mathematics teachers.

School samples: Representative samples of schools and teachers within schools.

Target response rates: 75% of the sampled schools, together with a 75% response rate from all sampled teachers in the country. A school is considered to have responded if 50% of sampled teachers respond.

Questionnaires: TALIS questionnaires for teachers and school principals with a special additional questionnaire for teachers of mathematics.

Mode of data collection: Questionnaires filled in on paper or on line.

Survey windows: For TALIS 2013: September-December 2012 for Southern Hemisphere countries and February-June 2013 for Northern Hemisphere countries. For PISA 2012: Usually between March-May 2012 for the Northern Hemisphere and between May-August 2012 for the Southern Hemisphere.

*TALIS defines a teacher as one whose primary or major activity in the school is student instruction, involving the delivery of lessons to students. Teachers may work with students as a whole class, in small groups or one-to-one inside or outside regular classrooms. They might also share their teaching time among more than one school.

***PISA-eligible* students are defined as those whose birthdates are within a specified range for that year's assessment and who are in grades 7 or higher (OECD, 2013b).

In terms of the delivery of the questionnaires, teachers and school principals were given the TALIS teacher and principal questionnaires, which require between 45 and 60 minutes to complete. Data was used from the PISA 2012 assessment for the sampled schools, as well as from the PISA main study student questionnaire and the PISA main study school questionnaire. (For more information on the TALIS questionnaires, see the TALIS 2013 Technical Report (OECD, 2014c). For more information on the PISA questionnaires, see the PISA 2012 Technical Report (OECD, 2014a).

Sampled teachers of mathematics were also given a short questionnaire asking them about the mathematics classes they teach. Mathematics teachers were asked in detail about the teaching practices they use in this class and their beliefs about the teaching and learning of mathematics in particular. These teachers were also asked about their levels of self-efficacy in relation to the teaching of mathematics. (For more information on the questionnaire for mathematics teachers, see the TALIS 2013 Technical Report.)

Interpretation of the results

TALIS results are based on self-reports from teachers and school leaders and therefore represent their opinions, perceptions, beliefs and accounts of their activities. Similarly, some of the PISA constructs, for instance measuring student motivation and attitudes toward school, are based on student self-reports. This is powerful information because it provides insight into how teachers perceive the learning environments in which they work, what motivates teachers and how policies that are put in place are carried out in practice. But, as with any self-reported data, this information is subjective and therefore differs from objectively collected data. The same is true of school leaders’ reports about school characteristics, which may differ from descriptions provided by administrative data at a national- or local-government level.

In addition, as a cross-sectional survey, TALIS cannot measure causality. For instance, in examining the relationship between school climate and teacher co-operation, it is not possible to establish whether a positive school climate depends on good teacher co-operation or whether good teacher co-operation depends on a positive school climate. The perspective taken in the analysis— i.e. the choice of predicted and predictor variables—is based purely on theoretical considerations, as laid out in the analytical framework. When a reference is made to “effects”, the reference should be understood in a statistical sense – i.e. an effect is a statistical parameter that describes the linear relationship between a predicted variable (e.g. job satisfaction) and a predictor variable (e.g. participation in professional development activities) – taking effects of individual and school background as well as other independent variables into account. Thus, the effects reported are statistical net effects even if they do not imply causality.

Additionally, the cross-cultural validity of the results is an important feature of the analysis, particularly with regard to the international scales and indices. Full details of the cross-cultural validity analysis are provided in the TALIS 2013 Technical Report (OECD, 2014c).

Finally, the intention of this paper is not to measure the effects of teaching on student outcomes. Neither the design of PISA nor the design of TALIS is amenable to analyses of teacher and teaching effectiveness, and the purpose of this paper is to use school-level data from PISA to contextualise teachers’ responses in TALIS.

Organisation of the paper

The following sections of this paper present the analyses, results and policy recommendations emerging from initial analyses of the TALIS-PISA link. The paper begins with a review of the literature in Section 2 that will help frame the analyses conducted in subsequent sections of the paper.

Section 3 examines the profiles of teachers and the schools in which they work, including a number of student factors as measured by PISA. It also includes a profile of mathematics teachers in particular. In doing so, it provides an important context for the later analytical sections.

Section 4 looks at teachers' experiences with professional development, as well as the needs they express for further development and support. The analyses in this section help identify any relationships between teacher professional development and the school-level profiles of student performance, student motivation and engagement with school.

Section 5 provides a profile of teacher beliefs about teaching and how they influence practice and behaviour. The section explores teachers' classroom practice, endeavouring to address questions such as to what extent teachers vary their instruction based on the unique characteristics of the students they teach. Analyses look at teachers' use of a variety of teaching practices, including collaborative practices with other colleagues. The teaching practices of mathematics teachers are also examined.

Section 6 examines whether teacher self-efficacy and job satisfaction are influenced by working in a school with either high or low student performance. The relationships between student motivation and engagement, student socio-economic background (all at the school level) and teacher self-efficacy are also explored. As in other sections, these analyses are presented for all teachers and for mathematics teachers.

Finally, section 7 summarises the key findings from previous sections of this report and provides recommendations for policy makers, school leaders and teachers.

SECTION 2: LITERATURE REVIEW AND OVERALL FRAMEWORK

TALIS 2013 Results: An International Perspective on Teaching and Learning (OECD, 2014b) has shown that most of the variation in self-reported teaching practices is found between teachers rather than between schools. For example, 87% of the variation in assigning small group work is accounted for at the teacher rather than the school or country level (OECD, 2014b). Nevertheless, school factors also impact teachers' work and, in turn, student learning. Thus, much of the discussion of school level factors in this section involves student factors that may influence the effectiveness and satisfaction of teachers. This section provides background on the key factors examined in this paper.

School profiles and teacher characteristics

Characteristics of schools – everything from demographics of the students served by a school to the administrative structure in a school – can have a substantial impact on school environment and teacher satisfaction (Perie and Baker, 1997). A major issue in many countries is diversity of the student population in schools. Burns and Shadoian-Gersing (2010) argue for the perspective that diversity of students should be viewed as a strength rather than a problem, but regardless of perspective, diversity is often an issue in schools and can represent a challenge for teachers. Students from low-income homes and recent immigrants to a country tend to score lower than the broader population on large-scale assessments (McEwan, 2009). When those students do not speak the primary language used in school, performance is also an issue. One of many reasons for low performance of recent immigrants and minority students is that teachers often have lower expectations for student performance in schools serving low-income students and minority students (McKown and Weinstein, 2008; Stipek, 2012; Wiggan, 2007). Thus, helping both new and experienced teachers adapt to working with diverse populations is challenging but a major priority in many countries (Burns and Shadoian-Gersing, 2010).

School climate is another important aspect of learning and teaching. Positive school climates emerge when teachers and students develop a safe and respectful environment that supports learning and helps teachers feel good about the success of their students (Loukas and Murphy, 2007). Positive school climates are related to fewer discipline problems which leads to more time for teaching and high teacher satisfaction (Guardino and Fullerton, 2010; Martella, Nelson and Marchand-Martella, 2003). School size is a factor in school climate and student achievement in that larger schools are able to provide a wider selection of courses and thus may do a better job of meeting the needs of high achievers (Schreiber, 2002). However, it is easier for larger schools to lose some of the personal touch found in smaller schools making the climate less welcoming for teachers and students alike (Leithwood and Jantzi, 2009). Another aspect of schools that impacts satisfaction and retention of new teachers is how schools assign teachers to classes. Unfortunately, according to Riggs and Sandlin (2007), teaching assignments often favour more experienced teachers. Specifically, Riggs and Sandlin studied 56 school districts and found that new teachers were often assigned to teach difficult students or to teach classes with a wide range of students who did not fit into classes that more experienced teachers were teaching. Although many of the districts provided induction programmes to help new teachers, the challenging students made the work of the new teachers even more difficult than the work of many of the experienced teachers.

Student characteristics and teacher engagement in professional development

Professional development is expected for teachers in almost all educational systems. This can range from mentoring and induction programmes for new teachers to programs designed to update the skills of experienced teachers on new topics such as use of ICT, and topics of continuing concern such as working with special needs or hard-to-reach students. This report is based on the premise that composition and characteristics of the student body in a school can have an impact on the professional development needs of teachers and on teachers' engagement in continued learning.

With respect to mathematics, Garet et al. (2010) studied a programme of professional development in lower secondary schools. On average, teachers in the professional development programme completed 55 more hours of mathematics-related professional development than control teachers. At the end of the one-year study, no difference was found on teachers' knowledge of rational numbers or on student learning, but teachers who participated were more likely to engage students in activities that elicited their thinking about mathematics. Dashet al. (2012) studied a 70-hour online professional development programme that took place over a one-year period. With 79 grade-3-teachers participating, the programme focused on fractions, algebraic thinking, and measurement. Like in the work by Garet et al. pedagogical knowledge and teaching practice improved as a result of the programme. Dash et al. did not assess teacher content knowledge but they found that mathematics knowledge of the teachers' students was not significantly impacted by the professional development programme. These findings suggest that pedagogical knowledge is easier to change than mathematics knowledge and that long-term professional development is important for meaningful change. In short, there is empirical support for the importance of teachers' engagement in continuous effective professional development. Thus, it is valuable to examine the school factors that may be related to teachers' needs for professional development as well as their participation in such development.

Although teachers request professional development for dealing with specific types of students, there is surprisingly little research on the extent to which student characteristics impact teacher engagement in professional development. Borman and Dowling (2008) conducted a meta-analysis of teacher attrition and while there are likely situations where professional development would not impact attrition, there are clearly situations where factors that lead to attrition are the same as factors that motivate teachers to participate in professional development. Borman and Dowling argue that individual teacher characteristics are a major factor in attrition but there are a number of school and student factors as well. School-based factors such as teacher salaries and funding cannot be improved by professional development but factors such as managing challenging classrooms, developing more productive collaboration with other teachers, and finding better ways to teach new curricula could be influenced by professional development. The meta-analysis also indicated that a strong mentoring programme decreased the chances of teachers leaving the schools they were in.

Student factors and teaching practices

This report examines the extent to which the profiles of students in a school are related to teachers' pedagogical practices in the classroom. One way in which student characteristics can be related to teacher practices is indirectly, through their influence on teacher beliefs. Namely, teachers make decisions based on their beliefs about the nature of teaching and learning (Beyer and Davis, 2008; Speer, 2008), and the characteristics of students can impact those beliefs. For example, in a study of nearly 500 teachers in Grades 3 and 5, Stipek (2012) found that when family income and overall student achievement were held constant, the teachers, most of whom were white, felt more efficacious about working with the minority students. This suggests that the characteristics of the student population affected the way the teachers thought about their accomplishments, which, in turn, impacted their satisfaction and likely influenced what they did in the classroom.

In addition, student characteristics may influence teacher practices by for instance dictating the level of difficulty for a class. As noted by Vieluf, Kaplan, Klieme, and Bayer (2012), appropriately challenging tasks for students are an important aspect of effective instruction. Perry, Turner, and Meyer (2006) clarify that tasks should be hard enough to require students to think deeply but easy enough to be accomplished. As a result students will learn while working on the difficult tasks and receive the gratification of solving them. Perry et al. (2006) also claim that tasks that are interesting to students or connect with what they already know are optimal. Thus students' previous knowledge can be an important criterion by which teachers may select tasks appropriate for their classrooms.

Student factors and teachers' self-efficacy and job satisfaction

Self-efficacy is an exceptionally broad construct that has been applied to self-perception across a wide variety of tasks and settings (Bandura, 1997). With respect to teaching, self-efficacy is sometimes divided into 2 distinct type: Domain-general and domain-specific. Domain general self-efficacy deals with perceptions of effectiveness in areas where all teachers need skills – areas like engaging students, planning and implementing lessons, managing classrooms, and helping students think critically (OECD, 2014b). Domain specific self-efficacy involves effectiveness in teaching specific content. For example, making a good argument from a historical perspective is different from making an argument from a scientific perspective and thus teachers need to be aware of ways of reasoning within their discipline. With respect to general teacher self-efficacy, research suggests that while teachers are satisfied with the instructional aspects of their positions, they may be unhappy with other factors such as salary and working conditions (Butt et al., 2005; Crossman and Harris, 2006).

A number of studies have demonstrated positive associations between teachers' self-efficacy and higher levels of student achievement and motivation, teachers' instructional practices, enthusiasm, commitment, job satisfaction, and teaching behaviour (Skaalvik & Skaalvik, 2007; Tschannen-Moran & Woolfolk Hoy, 2001; Tschannen-Moran & Barr, 2004; Caprara, Barbaranelli, Steca, & Malone, 2006). For example, Caprara et al. (2006) surveyed over 2000 teachers in 75 Italian middle schools about self-efficacy. These researchers found that self-reported efficacy beliefs were related to job satisfaction and, after controlling for prior achievement, student achievement. Kardos and Johnson (2007) found that novice teachers' commitment to their jobs was positively correlated with effective instruction. In short, it is likely that the relationship between student characteristics and teachers' self-efficacy and job satisfaction is bi-directional. Namely, students' performance can boost teachers' self-efficacy and job satisfaction, and more satisfied and confident teachers might be more motivated to engage in their work and thus boost student performance.

Much of the current research on mathematics teachers' efficacy is set in the greater context of self-efficacy as being just one of the many beliefs that teachers have about mathematics teaching and learning (Forgasz & Leder, 2008). Wilson and Cooney (2002) argue that mathematics teachers' beliefs about their own ability are related to their willingness to change in order to improve their teaching. And Stipek et al. (2001) maintain that the level of confidence teachers have as mathematics teachers is associated with their students' self-efficacy as learners of mathematics. In a study involving Canadian mathematics teachers, Archambault, Janosz, and Chouinard (2012) found a small but significant positive correlation between teacher self-efficacy and student achievement. Previous studies specific to student self-efficacy in mathematics have consistently shown a positive correlation between student confidence or self-efficacy in learning mathematics and achievement in the subject (Kloosterman, 1991; Kung, 2009; Petty, Wang, & Harbaugh, 2013).

In brief, teacher self-efficacy, job satisfaction, and student performance are inter-related. When students do well, teachers feel good about their efforts and tend to work harder and thus student performance stays strong. This is true for general teaching efficacy, which includes engaging and managing students, efficacy for teaching basic knowledge and procedural tasks, and efficacy for teaching critical thinking and problem solving.

SECTION 3: A PROFILE OF TEACHERS AND SCHOOLS

This section provides background information on the profile of teachers surveyed in the TALIS-PISA link and the schools in which those teachers work. The section first describes the demographic profile of teachers including gender and age, educational attainment and their work experiences. Then it provides information about a unique subset – mathematics teachers. The next section describes these teachers' schools, providing information about the school type, school size, location and programmes taught, based mostly on TALIS data. This section continues with a description of the student composition, including information about student performance, motivation, engagement, and socio-economic status, based mostly on PISA data. The section concludes with a description of school resources.

One key goal of the TALIS-PISA link is to explore the relationship between student-related factors, including socio-economic status and student attitudes and performance, and teachers' characteristics, beliefs, attitudes and practices. The results provide a unique opportunity for participating countries to learn about their own teaching workforce and the school environments in which they work, and to make cautious and reasonable comparisons with other participating countries. The overarching goal is to uncover areas that need more investigation and attention so that more research and more effective policies can be developed to improve teaching and student learning.

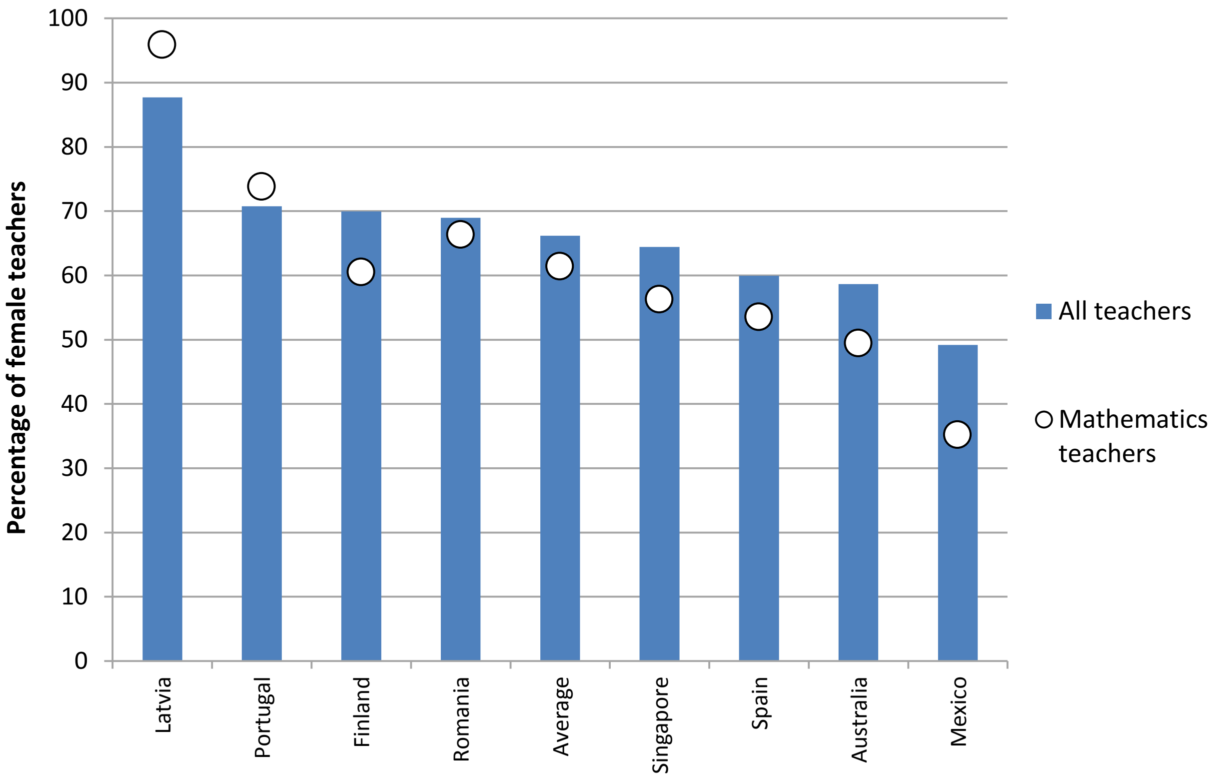
A profile of teachers

Demographic information about teachers can be used by countries to effectively manage human resources and project existing and future teacher staffing needs (OECD, 2013a). TALIS asked teachers and principals to provide information about their gender, age, years of working experience, educational attainment, teacher education or training programmes they had completed, school location, school size, class size and the degree to which inadequate school budget and resources is perceived to limit principals' effectiveness. PISA data includes information about the Economic, Social and Cultural Status (ESCS) of students who took the PISA assessment, as well as data on student performance in mathematics, student attitudes and motivation, and student truancy in the school. The next section describes the demographic characteristics for teachers in general as well as for mathematics teachers. See Box 2 for a description of the teacher sample.

Figure 1 shows the gender distribution of all teachers and of mathematics teachers in particular. On average, 66% of all teachers are female and 61% of mathematics teachers are female, see also Table 1. More than half of all teachers in lower secondary schools in participating countries except for Mexico are women. Similarly, results show that, except in Australia and Mexico, more than half of mathematics teachers are women. There is large variability among countries with 96% of mathematics teachers in Latvia and only 35% in Mexico being women.

Figure 1. Female teachers

Percentage of female teachers among all teachers and among mathematics teachers



Source: OECD, TALIS 2013 and PISA 2012 databases. See also Table 1 (Annex).

The most dramatic differences appear between Latvia and Mexico. In Latvia, 88% of all teachers and about 96% of mathematics teachers are female, while in Mexico 49% of all teachers and only 35% of mathematics teachers are female. The results in Figure 1 also show that in most participating countries (except Latvia and Portugal), there is a smaller percentage of female mathematics teachers than in the general teacher population.

Table 1 also shows that the average age of teachers in the eight participating countries is 43 years. Among the eight participating countries, Singapore has the youngest teacher workforce with an average age of 37 years while Latvia has the oldest teacher population with an average age of 47 years. Only 10% of teachers are under 30 years of age and about 30% of teachers are over 50 years of age. However, there is a degree of variability among the countries with 13% of teachers in Singapore and 55% in Latvia over 50 years. Furthermore, about 26% of teachers are under 30 years in Singapore and less than 3% in Portugal and Spain. For mathematics teachers, only 8% of them are under 30 years of age and about 33% of mathematics teachers are over 50 years of age. Again, there is a degree of variability among the countries with 11% of mathematics teachers in Singapore and 60% in Latvia over 50 years. In addition, about 19% of mathematics teachers are under 30 years in Singapore and less than 2% in Portugal and Spain.

Educational Attainment and Work Experience

There are numerous studies on the effects of teacher characteristics (e.g. educational attainment, in-service training, years of experience) on student achievement (Aaronson, Barrow, and Sanders, 2007; Rice, 2003; Wayne and Youngs, 2003). Although results are mixed on the impact of pre-service training on student learning (Rivkin, Hanushek, and Kain, 2001; Wayne et al., 2003), there is a preponderance of evidence showing that teacher quality influences student academic achievement and that teachers' work experiences are also positively related to student achievement, especially during the early years of a teacher's career (Hanushek and Rivkin, 2004; Wayne and Youngs, 2003; Gordon, Kane and Staiger, 2006, MET, 2013). Although this report does not focus on the impact of teacher experience on student achievement, it is still useful to look at these characteristics for mathematics and all teachers across the eight countries in order to understand the teachers' situation better.

Table 2 presents information about teachers' educational attainment, specifically the highest level of formal education completed by teachers in general and mathematics teachers in particular. The information in this figure includes the percentages of teachers with various levels of education, as defined by the International Standard Classification of Education (ISCED 1997), which identifies comparable levels of education across countries.[1] As seen in the figure, most teachers in the analysed countries are highly educated.

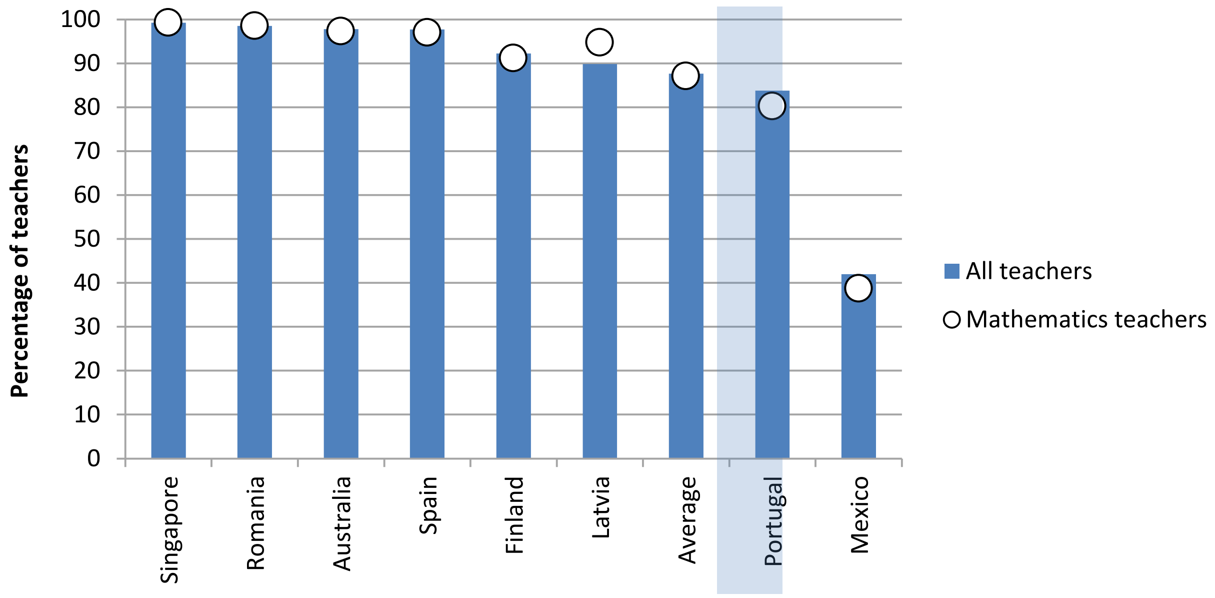
In general, slightly higher levels of mathematics teachers report educational attainment at ISCED level 5A or above than teachers from all subjects combined. The exception to this was in Romania where only 92% of mathematics teachers report ISCED level 5A or above compared to 95% of all teachers in Romania who report this level of formal education.

Figure 2 shows that in six of the eight countries, over 90% of teachers report completion of a teacher education or training programme (see also Table 3). Only in Mexico was this statistic below 50%. There is little difference between teachers in general and mathematics teachers in the proportion who report having completed a teacher education or training programme. The majority of teachers report that content, pedagogy and practical elements were included in their formal education and training. For pedagogy of the subjects being taught, on average, 71% of all teachers report that their formal education included pedagogy for all the subjects they are teaching and 22% of teachers report that their formal education included pedagogy for some of the subjects they are teaching. For practical components, the results are similar to the results reported for content and pedagogy. Across all three elements in formal education and training (i.e. content, pedagogy and practice), teachers from Latvia, Romania and Singapore report the highest completion rates.

[1] ISCED 5 represents the first stages of tertiary education and is split between ISCED levels 5A and 5B. ISCED level 5B programmes are generally more practically oriented and shorter than programmes at ISCED level 5A. ISCED level 5A typically includes Bachelor's degrees and Master's degrees from universities or equivalent institutions. ISCED level 6 represents further education at the tertiary level that leads to an advanced research qualification such as a Doctorate degree.

Figure 2. Completion of a teacher education or training programme

Percentage of teachers who completed a teacher education or training programme



Source: OECD, TALIS 2013 and PISA 2012 databases. See also Table 4 (Annex).

Similarly, Figure 2 also shows that at least 8 out of 10 mathematics teachers in participating countries have completed a teacher education or training programme (except in Mexico with 39%). On average, a slight majority of mathematics teachers report having received training in mathematics content prior to becoming a teacher, though there are large differences between countries (e.g. 19% in Latvia and 68% in Portugal). In Latvia and Spain, over a quarter of the mathematics teachers report never having received mathematics training on par with what would be required for a degree in mathematics. Many respondents received training via courses or practice in teaching mathematics before becoming a teacher. Again, there are wide variations between countries. In Latvia, only 7% of mathematics teachers took courses on how to teach mathematics before becoming a teacher, whereas 65% took such courses after becoming a teacher, and only 2% never took such courses. In Finland and Romania, mathematics teachers are more likely to have done their coursework and had practice in teaching mathematics before becoming teachers.

Box 2. Elements specific to mathematics teacher training

Elements specific to mathematics teacher education or training were documented in the Mathematics module of the TALIS questionnaire. Teachers were asked whether they received training in these elements before, after, both before and after, or never in relation to becoming a teacher. These elements include:

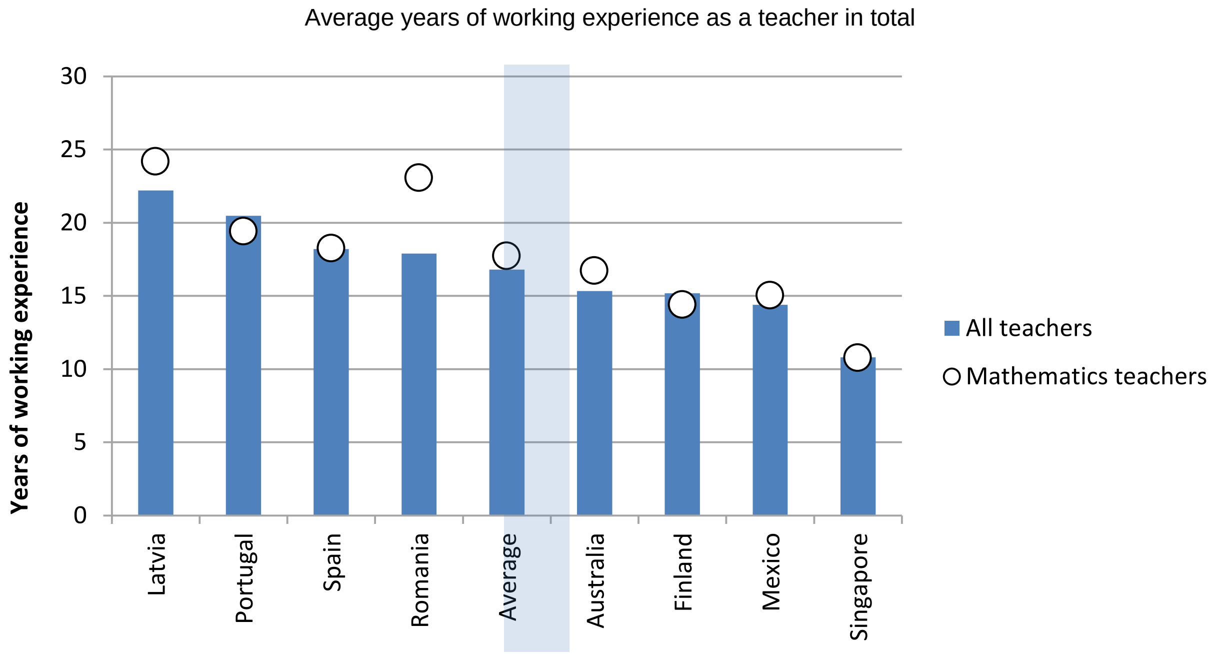
- mathematics courses equivalent to those needed for a degree in mathematics;
- courses on how to teach mathematics;
- practice teaching in mathematics.

Apart from teacher educational attainment and training programmes, teachers' work experiences considerably shape teaching practices and influence their resilience and coping strategies (Carton and

Fruchart, 2014). Figure 3 shows the average years of working experience of teachers of all subjects combined and of mathematics teachers more specifically (see also Table 5). Across the eight countries, teachers report an average of 10 years of working experience as a teacher at their schools and 17 years of working experience as a teacher in total. Mathematics teachers are slightly more experienced, and report an average of 11 years of working experience as a teacher at their schools and 18 years of working experience as a teacher in total. There is variability among the countries with mathematics teachers from Latvia reporting about 6 more years of working experience as a teacher than the average for the eight countries (See Table 5). On average, teachers have spent 1/2 to 2/3 of their careers as teachers teaching in their present schools. Educational literature is replete with the huge cost of teacher attrition.

Figure 3 illustrates that the difference between mathematics teachers and all teachers in Romania stands out compared to other countries. In Romania, mathematics teachers have on average 5 more years of experience than teachers in general (23 vs. 18 years).

Figure 3. Years of working experience as a teacher



Source: OECD, TALIS 2013 and PISA 2012 databases.

School profiles

This section provides information about the school profiles including the type, size, location of schools, as well as on characteristics of the student populations in the schools. Since TALIS focuses on teachers and their work environment, the results are presented from a teacher's perspective. The data therefore represent the *proportion of teachers who work in schools* with certain characteristics rather than the *proportion of schools* with certain characteristics.

Table 6 shows the school location or rather the size of the communities in which teachers work. On average, between one-fifth and one-third of teachers work in schools in small towns (22%), towns (30%), cities (24%) or large cities (29%). Furthermore, as reported by the principals, the majority of the TALIS-PISA teachers work in public schools (85%) and schools that compete with two or more other schools for at least some of their students (76%) (see also Table 7). However, the proportions vary across the participating countries. For example, 100% of teachers in Singapore were reported by the principals as working in public schools while only 50% of teachers in Australia work in public schools. In addition, over 90% of schools in Australia and Singapore were reported by principals as competing with two or more other schools for at least some of their students.

Literature shows that school size can be related to the attitudes of teachers and students, for instance Lee and Loeb (2000) show that Chicago teachers have more positive attitudes in small elementary schools. However, more large-scale research is needed in order to build consensus on the effects of school size on teacher and student characteristics. In addition, researchers, policy makers and stakeholders have debated the effect of class size and pupil/teacher ratio on student achievement, completion of school as well as long-term effect on wages after graduation (Fredriksson, Öckert, & Oosterbeek, 2013; Schanzenbach, 2014).

School-level student composition

In order to examine the relationships between student factors measured in PISA and teacher outcomes measured in TALIS, student data from the 2012 PISA student questionnaire were aggregated to the school level and added as school-level data to the TALIS 2013 data. (Please refer to Boxes 3-7 for details on which PISA student variables were added to the TALIS data for analyses included in this report).

Economic, Social and Cultural Status (ESCS)

Table 8 shows that schools in wealthier countries, such as Australia and Finland, have less variability in ESCS among their students compared to countries like Mexico and Portugal. There are some implications of higher ESCS variability for teachers - because of higher ESCS variability, students will differ more in the array of opportunities and support they receive at home and in their communities. For example, students from high ESCS homes will have more resources and support for learning and those from low ESCS homes may not have as much support. Hence, when there is large variability in the school, teachers may be presented with a challenge of supporting and teaching students with very different levels of needs. Such teachers may need to be supported in working with students with such ESCS variability. Table 8 also shows that across the eight participating countries, PISA mathematics achievement average score was 486 with Singapore scoring highest (571) and Mexico lowest (404).

Box 3. Student economic, social and cultural status index and PISA mathematics achievement

Index of ESCS

The PISA index of Economic, Social and Cultural Status (ESCS) was derived from the following three indices:

- Highest occupational status of parents (HISEI).
- Highest educational level of parents in years of education according to ISCED (PARED).
- Home possessions (HOMEPOS). The index of home possessions (HOMEPOS) comprises all items on the indices of WEALTH, CULTPOSS and HEDRES, as well as books in the home recoded into a four-level categorical variable (0-10 books, 11-25 or 26-100 books, 101-200 or 201-500 books, more than 500 books).

Please see the supplemental material or the PISA 2012 Technical Report (OECD, 2014a) for more information on the construction of this index.

Index of mathematics achievement

PISA 2012 provides an overall mathematics literacy scale, drawing on all the questions in the mathematics assessment. The metric for the overall mathematics scale is based on a mean for OECD countries set at 500 in PISA 2003, with a standard deviation of 100. To help interpret what students' scores mean in substantive terms, the scale is divided into levels, based on a set of statistical principles, and then descriptions are generated, based on the tasks that are located within each level, to describe the kinds of skills and knowledge needed to successfully complete those tasks. PISA applies a standard methodology for constructing proficiency scales. A description of the modelling technique used to construct this scale can be found in the PISA 2012 Technical Report (OECD, 2014a).

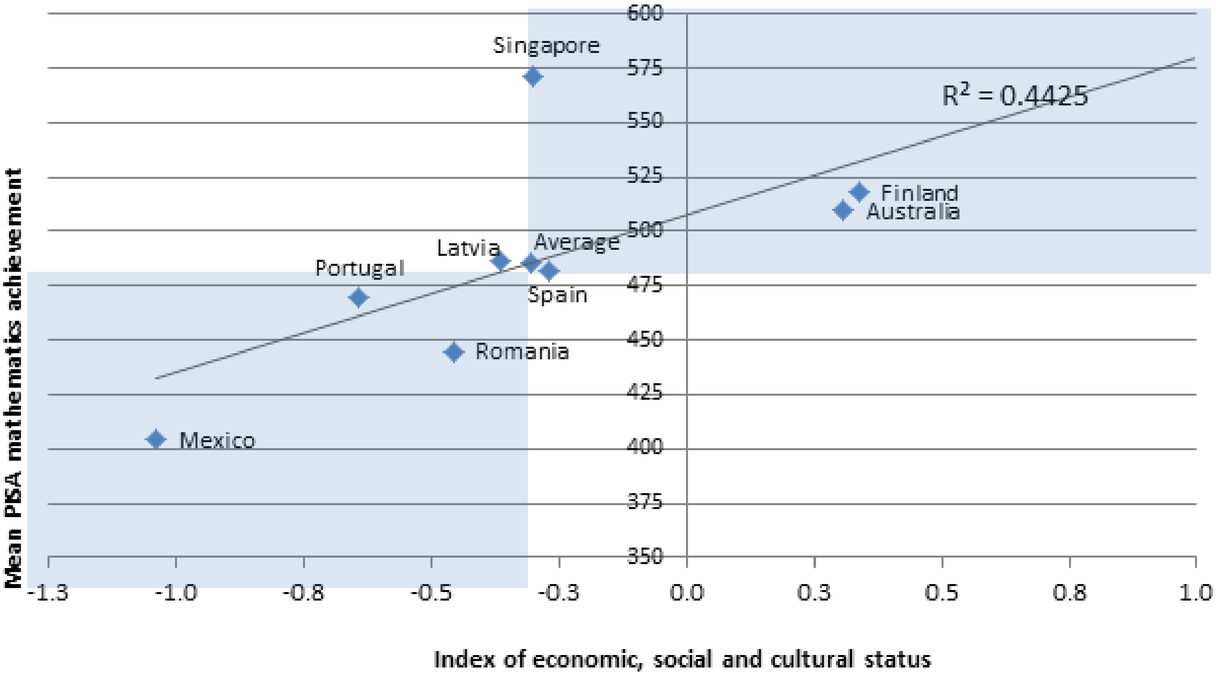
The PISA index of Economic, Social and Cultural Status (ESCS) and the PISA mathematics achievement plausible value scores were mean aggregated to the school level and within school standard deviation was calculated for inclusion with the teacher data.

1. Student PISA math score school level mean (PV_MATH_MEAN).
2. Student economic, social and cultural status school level mean (ESCS_MEAN).
3. Student economic, social and cultural status within school Standard Deviation (ESCS_SD).
4. Student PISA math score within school Standard Deviation (PV_MATH_SD).

Figure 4 illustrates the relationship between ESCS and the average PISA mathematics achievement level. The figure shows a trend of increasing PISA mathematics achievement levels as the level of ESCS increases (see Box 3 for more information).

Figure 4. Economic, social and cultural status and PISA mathematics achievement

School-level mean Economic, Social and Cultural Status (ESCS) and mathematics achievement



Source: OECD, TALIS 2013 and PISA 2012 databases.

Student attitudes towards school and learning

Research has shown that student attitudes towards school and learning can be influenced by a number of factors including school climate, sense of belonging and previous school performance (Candeias, Rebelo and Oliveira, 2010; Osterman, 2010; Wegner, Garcia-Santiago, Nichols, 2006; Nishimura and Hishinuma, 2010). For example, Shann (1999) found that a positive school climate results in positive relationships among teachers and students and positive student attitude towards school. In addition, research has shown that if students feel accepted and included in their schools, they develop positive attitudes and emotions towards school and learning (Osterman, 2000; Resnick et al., 1997). Boxes 4 and 5 show index scales that are used to represent these attitudes.

Box 4. Student attitudes about school and learning

A number of index scales representing general student attitudes about school and learning were used from the PISA 2012 database. They are listed below with sample questions that were used to create the scale:

- Attitude towards School: Learning Outcomes (ATSCHL)
  - School has done little to prepare me for adult life when I leave school.
  - School has helped give me confidence to make decisions.
- Attitude towards School: Learning Activities (ATTLNACT)
  - Trying hard at school will help me get a good job.
  - I enjoy receiving good grades.
- Sense of Belonging to School (BELONG)
  - I make friends easily at school.
  - I feel lonely at school.
- Perseverance (PERSEV)
  - When confronted with a problem, I give up easily.
  - I continue working on tasks until everything is perfect.
- Teacher Student Relations (STUDREL)
  - Students get along well with most teachers.
  - Most of my teachers treat me fairly.

For further details on these scales and the questions from which they were calculated, please see Annex A1 of PISA 2012 Results: Ready to Learn: Students' Engagement, Drive and Self-Beliefs (Volume III).

Countries differ in the distribution of student attitudes toward school among the eight participating countries. There are many subtle differences in means and distributions across the countries. Mean comparisons may be problematic due to differences in response styles and scale invariance across the countries. However, the extent of the variability across countries for the five student attitude scales presents some interesting similarities and differences. For example, there appears to be a similar level of variability between Australia and Romania on student attitudes toward school. Finland and Singapore are consistent across the five scales for low variability (meaning that students tend to be more similar to each other within schools on these characteristics than in other countries), while countries like Australia, Latvia, Mexico, Romania, and Spain display higher levels of variability among their student populations on these characteristics.

Student attitudes toward mathematics

Some students have negative attitude towards mathematics and this can affect their self-efficacy and learning of mathematics. There is evidence that generating positive student attitude toward mathematics is one of the major goals of mathematics education (Hannula, 2002; Nicolaidou & Philippou, 2003). This report also seeks to provide information about student mathematics attitude to see whether these might be related to mathematics teachers' attitudes and practices (see Box 5 for scales used to represent student attitudes about mathematics).

Box 5. Student mathematics attitudes

A number of index scales representing student attitudes about mathematics were examined from the 2012 PISA database. They are listed below with sample questions that were used to create the scale:

- Mathematics Anxiety (ANXMAT)
  - I often worry that it will be difficult for me in mathematics classes.
  - I get very tense when I have to do mathematics homework.
- Instrumental Motivation for Mathematics (INSTMOT)
  - Making an effort in mathematics is worth it because it will help me in the work that I want to do later on.
  - I will learn many things in mathematics that will help me get a job.
- Mathematics Interest (INTMAT)
  - I enjoy reading about mathematics.
  - I look forward to my mathematics lessons.
- Mathematics Self-Efficacy (MATHEFF)
  - How confident do you feel understanding graphs presented in newspapers.
  - How confident do you feel solving an equation like 3x+5= 17.
- Mathematics Work Ethic (MATWKETH)
  - I finish my homework in time for mathematics class.
  - I am prepared for my mathematics exams.
- Mathematics Self-Concept (SCMAT)
  - I am just not good at mathematics.
  - I get good grades in mathematics.

For further details on these scales and the questions from which they were calculated, please see Annex A1 of PISA 2012 Results: Ready to Learn: Students' Engagement, Drive and Self-Beliefs (Volume III).

Countries differ in terms of the distribution of student attitudes toward mathematics among the eight participating countries. Again, mean comparisons may be problematic due to differences in response styles and scale invariance across the countries. Romanian students stand out in instrumental motivation for mathematics as having a much lower score on this scale even though their scores for the other five scales are comparable to the other seven countries. Singapore stands out as having consistently high attitudes among students on five of the six scales for mathematics. The sixth scale, math anxiety, shows that students in Singapore report an average level of mathematics anxiety compared with the other five countries. The variability of mathematics attitudes seems consistent across countries for each scale regardless of the average response of students. Finland, Latvia and Singapore tend to display lower variability of mathematics attitudes compared with the other five countries. However, these differences could be negligible, suggesting that teachers across the eight countries have to deal with very similar levels of variability in attitudes among students toward mathematics.

Student truancy

A meta-analysis found that chronic truant students benefit from interventions geared toward improving attendance in schools (Maynard, McCrea, & Kelly, 2012). Hence, many countries are interested in understanding the degree of truancy in schools so that appropriate interventions and policies could be devoted to minimising truancy in schools.

Table 9 shows the average school truancy rates based on student reporting on how often they skipped a day, skipped a class or were late to school. Box 6 describes how the truancy rate was derived.

Box 6. Measures of student truancy used in this report

Student truancy variables from the PISA database were examined for inclusion in the analysis. Three variables were selected to represent truancy: Items on whether the student reported having skipped a class, skipped a day of school, or was late for school within the last two weeks prior to taking the survey. Since the responses to these categorical variables had to be aggregated to the school level, it was decided to record the percent of the student body in each school who responded that they skipped, or were late, at least once in the last two weeks.

- Percent of students who arrived late to school (LATE_PCT): ST08 was aggregated to the school level
- Percent of students who skipped a whole day of school (SKIPDAY_PCT): ST09 was aggregated to the school level
- Percent of students who skipped a class (SKIPCLASS_PCT): ST115 was aggregated to the school level

These variables were then merged onto the teacher data set as school level context variables.

In addition, these three aggregated variables were averaged together for each student to create a new variable measuring a general mean truancy rating for each school (TRUANCY_AVG). This was done for 3 reasons:

1. To reduce the number of variables in the analysis in order to reduce Type I error.
2. A single merged variable would exhibit a higher occurrence of significance across countries and be more parsimonious.
3. To reduce the number of interaction terms in the model. Interactions between teacher level variables and truancy needed to be tested. Creation of a single truancy measure was a parsimonious way of accomplishing this.

The resulting weighted means across countries for this variable (Table 9) produced results comparable to what would be obtained by obtaining the percentage of students reporting truancy in the PISA database. Values differ slightly due to the weighting by the teacher weight (TCHWGT) and the fact that not all schools in each country participated in the TALIS-PISA link.

Table 9 shows that on average teachers work in schools with a truancy rate of 31% across the participating countries. However, there is a degree of variability in average school truancy among the countries with 16% in Singapore and 47% in Latvia. In addition, results show that teachers in Latvia on average deal with the highest degree of truancy in terms of students skipping a class (66%) compared with other countries (e.g. 13% in Singapore).

Home language and student birth country

There is a growing research base indicating that the home language of students impacts their academic achievement (Goldenberg, 2008). For example, reviews of research have shown educational benefits of programmes that incorporate the use of home language, especially if the home language is different from the language of the classrooms (Genesee & Lindholm-Leary, in press). This section examines the home language and birth country of students as these may represent a key contextual factor that may influence teacher’s attitudes and practices. Box 7 describes the measures used to determine student immigrant background.

Box 7. Measures of student immigrant background used in this report

Student birth country and language spoken in the student's home as measured in the PISA Student Questionnaire were also included in the analyses of this report. These variables were also aggregated to the school level and then merged onto the TALIS database.

- Whether the student was born in the country being surveyed or in another country, ST20 (BIRTHCOUNTRY_PCT).
- Whether the student speaks a different language at home from the language of the country being surveyed, ST25 (LANG_PCT).

Each aggregated variable represented the percent of each school population who indicated a different birth country or different home language.

Table 10 shows the average number of students in each country whose home language was different from the language of the test (or survey). Results show that in Singapore, over half of the students speak a different language at home (55%) than the language of the test. Conversely, in Mexico, Portugal and Romania, less than 3% of the students speak a different language at home than the language of the test.

Table 10 also shows the average number of students in each country whose birth country was different from the participating country. Results from the table show that, on average, 6% of students were born in other countries different from the participating country. However, there is a degree of variability with half of the countries having less than 4% of students whose birth country was different from the participating country [Finland (3%), Latvia (1%), Mexico (1%) and Romania (1%)]. The other countries have over 8% of students whose birth country was different from the participating country.

SECTION 4: TEACHER PROFESSIONAL DEVELOPMENT

This section provides information on how the school profiles of student variables relate to teacher self-reported effective professional development characteristics, their need for professional development in teaching for diversity and subject matter and pedagogy. The second part of this section examines the pattern of relationships more closely within countries.

Professional development of teachers refers to activities geared toward developing teachers' skills, knowledge and ability to effectively handle the classroom and influence student learning (OECD, 2014b). Given the complex nature of the teaching environment, professional development may focus on several topics including pedagogical approaches for fostering and managing diversity in the classroom or teaching student with vastly different ability levels in the same classroom, targeted training in teaching a subject matter, etc. This section focuses on three types of measures of professional development as examined in TALIS:

1. Teachers' reports of engagement in professional development which is characterised by elements known to be indicators of effective development opportunities.

2. Teachers' reported need for professional development for teaching for diversity.

3. Teachers' reported need for professional development in subject matter and pedagogy.

Box 8 outlines the items from the questionnaire that are used to create a single measure of these three content areas.

Box 8. Description of the professional development variables used in this section

Three dependent variables were used in the analysis: Effective professional development characteristics (TEFFPROS), the need for professional development for teaching for diversity (TPDDIVS), and the need for professional development for pedagogy (TPDPEDS). These indices were made up of items from the TALIS survey, reflecting participation in activities with the specified characteristics (as in TEFFPROS) or the need to participate in activities in the specified areas (TPDDIVS, TPDPEDS). Examples, for each scale, of the items that made up these index variables are given below:

Effective professional development characteristics:

- a group of colleagues from my school or subject group
- opportunities for active learning methods (not only listening to a lecturer)
- collaborative learning activities or research with other teachers
- an extended time-period (several occasions spread out over several weeks or months)

Need for professional development for teaching for diversity:

- approaches to individualised learning
- teaching students with special needs (see Question [9] for the definition)
- teaching in a multicultural or multilingual setting
- teaching cross-curricular skills (e.g. problem solving, learning-to-learn)
- approaches to developing cross-occupational competencies for future work or future studies
- student career guidance and counselling

Need for professional development in subject matter and pedagogy. Five items total:

- knowledge and understanding of my subject field(s)
- pedagogical competencies in teaching my subject field(s)
- knowledge of the curriculum
- student evaluation and assessment practice
- student behaviour and classroom management

See the TALIS 2013 Technical Report (OECD, 2014c) for more details about the construction of indices in TALIS. Because the overall indices did not reach scalar invariance, it is not possible to directly compare scores between countries.

Multiple linear regression models are examined for each individual country using teacher background variables and student factors as predictor variables. Box 9 describes the school and teacher background variables (from TALIS) and the student variables (from PISA) that are used in the models.

Student measures include the school average Economic, Social and Cultural Status (ESCS), mathematics achievement, attitudes toward school and teacher-student relations. Additionally, truancy measures and proxy variables for immigration status are also examined from the student PISA data.

Moreover, the within school variability (standard deviations) of ESCS and student mathematics achievement are included as school level predictors.

After an initial examination of the relationship between these student factors and the teacher measures of professional development in the first part of this section, multilevel models are employed to examine interaction effects between teacher and student variables in the second part of the section. For instance, interaction effects between student attitudes toward school and teacher gender on teachers' reported needs for professional development can indicate whether student attitudes toward school affect male teachers' need for professional development differently than female teachers' needs.

Box 9. Variables used in the multiple linear regression analyses

A broad range of teacher, school, and student background variables were examined for inclusion in the analysis for this section. Student and school background variables were detailed in Section 3 along with student variables that were chosen as the predictor variables for all analysis. As outlined in Section 3, all PISA student variables were aggregated to the school level for merging onto the TALIS teacher data set by country and school. The background variables include:

- school location (TC2G09)
- school type (TC2G10)
- number of school staff (TC2G12A, TC2G12B, TC2G12C, TC2G12D, TC2G12E)
- school programmes (TC2G13A1, TC2G13B1, TC2G13C1, TC2G13D1, TC2G13E1)
- school enrollment (TC2G14)
- inadequate school budget and resources (TC2G26A)
- teacher gender (TT2G01)
- teacher years of experience (TT2G05B)
- teacher education (TT2G10)
- teacher training programme (TT2G1)
- mathematics teacher vs. other teacher indicator (MPART).

Previous research on the PISA data set as well as on the TALIS-PISA linked data indicated that student motivation, attitudes, engagement, and self-efficacy provided little explanatory power for teacher outcomes. Initial analysis entered these student level variables as a first block, aggregated to the school level, and in stepwise fashion to determine significance. Significant variables (see Table 11) were then maintained when student truancy and demographic variables were added to the final model:

- student attitudes toward school – learning outcomes (ATSCHL_MEAN)
- student attitudes toward school – learning activities (ATTLNACT_MEAN)
- student sense of belonging to school (BELONG_MEAN)
- student instrumental motivation (INSTMOT_MEAN)
- student perseverance (PERSEV_MEAN)
- student perception of teacher/student relations (STUDREL_MEAN).

Box 9. Variables used in the multiple linear regression analyses *(continued)*

Only two of these predictors (ATSCHL_MEAN, ATTLNACT_MEAN) were significant as main effects within any country.

The following variables were added to the analysis as a second block:

- student economic, social and cultural status (ESCS_mean)
- student PISA mathematics score (PV_MATH_MEAN)
- student economic, social and cultural status (ESCS_MEAN)
- student economic, social and cultural status standard deviation (ESCS_sd)
- student PISA mathematics score standard deviation (PV_MATH_SD)
- student repeated at least one grade (Repeated_pct)
- student late to school (Late_pct)
- student skipped school (SkipDay_pct)
- student skipped class (SkipClass_pct)
- student gender percent female (Gender_pct)
- student other birth country (BirthCountry_pct)
- student other language (Lang_pct).

Few predictors were significant as main effects across multiple countries and in any systematic way beyond what would be expected as a result of Type I error.

The effect of student factors on teacher's engagement in effective professional development

Participation in professional development activities that focus on how teachers can facilitate collaborative and active learning practices can be very effective (Sturko and Gregson, 2009). TALIS asked teachers about their professional development activities during the 12 months prior to the survey. This section reports on the relationship between the average student attitude toward school, ESCS, and mathematics achievement in the school and teachers' engagement in development activities which they perceived to have characteristics associated with effective professional development.

Table 11 shows that the only country where a relationship is apparent between the average student attitude toward school and teachers' reported participation in effective professional development is in Latvia where teachers who work in schools where students tend to have more positive attitudes also tend to engage more in effective forms of professional development. A similar pattern of results exists for Latvia with the average variability of mathematics achievement scores in the school. Specifically, teachers in schools with greater mathematics achievement variability reported more effective professional development characteristics.

In addition, Table 11 shows the relationship between teacher effective professional development and student ESCS. Teachers in schools with higher average ESCS in Finland and Romania are more likely to say that their professional development had effective characteristics. Conversely, teachers in schools with higher average ESCS in Portugal are less likely to say that their professional development had effective characteristics. Moreover, teachers in Australia and Romania who work in schools with students from more diverse economic backgrounds (i.e. with higher ESCS variability) tend to report more effective professional development characteristics. However, in the remaining six countries, there is no statistically significant relationship between teachers who reported effective professional development characteristics and diverse economic background of students.

In terms of the levels of truancy in the school, few statistically significant findings with respect to teachers' engagement in effective development activities are observed. Among the statistically significant relationships, teachers in Australia and Latvia who work in schools with a high level of truancy (as measured by the percentage of students who skip classes or a day of school) report fewer effective characteristics in the professional development in which they took part.

No statistically significant effects are found for teachers working in schools with a high immigrant population (as measured by birth country and primary home language) and effective professional development characteristics. This indicates that teachers' participation in effective forms of professional development is as common in schools with higher or lower proportions of students from immigrant backgrounds.

Table 12 shows the findings for mathematics teachers. In Australia and Portugal, mathematics teachers who work in schools where students tend to skip classes more often report fewer effective professional development characteristics. But in Mexico, teachers who work in schools where students skip whole days of school report fewer effective characteristics in their professional development, while those who work in schools where student skip classes report more effective characteristics in their professional development. These findings are somewhat counterintuitive and warrant further investigation; it is possible that in Mexico patterns of low truancy (skipping a class) and high truancy (skipping a day) are affected by other variables not included in the analyses, which also affect teachers' professional development.

In Romania, mathematics teachers who work in schools with higher proportions of students with mathematics anxiety are less likely to identify effective characteristics in their professional development, while the opposite is true for teachers who work in schools with higher average student interest in mathematics.

In Australia, teachers who work in schools with higher average student mathematics interest are also more likely to identify effective characteristics in their professional development. Moreover, teachers who work in schools where students have lower levels of mathematics self-efficacy are less likely to identify effective characteristics in their professional development activities.

Regarding indicators of the immigration background of students in the school, mathematics teachers in Romania are less likely to identify effective characteristics in their professional development if they work in schools with larger proportions of students from immigrant backgrounds. The opposite is found in Australia.

Mathematics teachers' reported number of effective professional development characteristics is not influenced by the average mathematics achievement of students in their schools in any country, except for Mexico, where teachers in schools with higher average achievement levels report fewer effective professional development characteristics.

The effect of student factors on teachers' need for professional development in teaching for diversity

Classrooms are increasingly becoming diverse today and there is a greater need for teachers to meet the learning needs of diverse students (Katz, Sutherland & Earl, 2005). This section reports on the relationship between the average student factors in the school and teachers' reported need for professional development in teaching for diversity. Table 13 reveals a mixed set of relationships between student factors and teachers' reported unmet needs for professional development in teaching for diversity.

Results from Australia, Finland, and Latvia show statistically significant relationships between the need for professional development for diversity and immigrant measures (as measured by the percentage of students whose birth country is different from the country of survey in Australia, and whose home language is different from the language of survey in Finland and Latvia).

In Australia, teachers in schools with a higher percentage of students born in another country reported needing fewer professional development courses in teaching for diversity. This seems counter-intuitive; however, this may be an indication that there may be resources already in these schools helping teachers with these populations. Alternatively, these schools may have immigrant students who have similar attributes (language, culture, etc.) to Australian students or Australian teachers might be more accustomed to students born in another country than teachers in Finland and Latvia. If that is the case, then there will be less need for professional development courses in teaching for diversity. However, teachers in Finland and Latvia tend to feel more of a need for this type of professional development when teaching in schools with a higher percentage of students whose primary language at home is different from the country of the survey.

Moreover, Romania displays a significant positive relationship between the need for professional development in teaching for diversity and the variability of student ESCS in the school. This indicates that in schools with greater student diversity (or variability) in terms of ESCS, teachers feel a greater need for professional development in teaching for diversity.

Table 13 also shows that there are no statistically significant effects for the truancy variables (as measured by the percentage of students who are late to school, skipped classes or skipped a day of school). Namely, there is also no statistically significant association between the percentage of students who repeated at least one grade and the reported needs for professional development in teaching for diversity, except in Singapore where teachers working in schools where a greater number of students have repeated grades also indicate a higher level of need for professional development in teaching for diversity.

In addition, in Australia and Finland, teachers report less of a need for professional development in teaching for diversity in schools with higher average mathematics achievement. This may be an indication that there is less diversity in schools with higher mathematics achievement in these two countries or that that good student performance boosts teachers' perception of their capabilities thus lowering their need for professional development.

The measure of student attitudes toward school is not significantly related to the need for professional development in teaching for diversity, in any of the eight countries. This may be an indication that this need is linked to teachers' own observations of their needs for professional development in teaching for diversity rather than the interplay of student attitudes and their needs. This is also evidenced by the fact that the measure for student-teacher relations is highly non-significant across all the countries and dependent variables in this section.

Mathematics teachers' reported needs for professional development for diversity appear to be more affected by student factors than teachers more generally. Indeed, Table 14 shows a greater number of significant effects than Table 13. But these relationships differ between countries. In Mexico, mathematics teachers who work in schools with higher proportions of immigrant students and students with higher language diversity also tend to report higher needs for professional development in teaching for diversity. But in Finland, although the same is true for teachers working in school with higher language diversity, the opposite is the case for teachers working in schools with more students who come from other countries.

Positive associations between student ESCS and teachers outcomes are found in Romania. Mathematics teachers in Romania who teach in schools with higher levels of student ESCS as well as with higher ESCS variability indicate a greater need for teaching for diversity.

Mixed findings emerge between countries for truancy. Mathematics teachers in Latvia and Spain who work in schools where more students skip classes are less likely to report a high need for professional development in teaching for diversity, while mathematics teachers in Finland and Mexico who work in schools where more students skip whole days are more likely to report such high needs.

In Australia, mathematics teachers in schools with higher levels of student mathematics anxiety indicate less of a need for professional development in teaching for diversity. This could indicate a missed opportunity for teachers to help students with high mathematics anxiety in as much as professional development in teaching for diversity could be used to address this challenge.

There are interesting relationships between two student attitude measures and mathematics teachers' reported need for professional development in teaching for diversity in Finland. Student perceptions of mathematics classroom management are negatively associated with mathematics teachers' reported need for diversity professional development, indicating that the more students see their teachers as good classroom managers the less likely are the teachers in that school to report the need for diversity professional development. This could indicate that students' perceptions match teachers' feelings of being capable enough in handling classrooms, with less of a need for further training. On the other hand, student perceptions of mathematics teacher support are positively associated with mathematics teachers' need for diversity professional development, which could indicate that Finish students' perceptions of teachers' support are reflective of teachers' willingness to further develop their abilities.

The effect of student factors on teachers' need for professional development in subject matter and pedagogy

Table 16 presents the results of the analyses employing the same student factors from PISA to examine their relationship with teachers' reported need for professional development in subject matter and pedagogy. In general these student variables do not seem to affect teachers' reported needs in these areas. For example, there are no significant effects between teachers' reported need for professional development in subject matter and pedagogy and the student measures for truancy, repeated grade and home language measures.

It is noteworthy, however, that teachers in Mexico and Romania who work in school with greater mathematics achievement variability report a greater need for professional development in subject matter and pedagogy. This may indicate that these teachers are seeing more challenges in conveying their subject matter in schools with wider achievement gaps among students.

Table 16 also shows that in Romania, teachers in schools with higher ESCS variability among students report less of a need for professional development in subject matter and pedagogy. This is in contrast with results reported earlier where teachers in Romania reported higher needs for professional development in the area of teaching for diversity in schools with higher diversity in student ESCS.

There is also a statistically significant relationship between the percentage of students born in another country within a school, and teachers' reported need for professional development in Australia. Namely, teachers in Australia reported less of a need for professional development in subject matter and pedagogy in schools with higher percentages of immigrant students.

Interestingly, Table 16 shows a greater number of statistically significant findings for mathematics teachers. Unlike the pattern seen in Mexico for teachers in general, mathematics teachers reported less of a need for professional development in subject matter and pedagogy in schools with higher mathematics achievement variability. This suggests that it is teachers of other subject areas than mathematics who may be having difficulties conveying their subject matter to students with wide variations in achievement. Meanwhile, mathematics teachers in Romania do report less of a need for professional development in subject matter and pedagogy in schools with higher mathematics achievement means, which is in line with the results for teachers in all subjects combined.

In Australia mathematics teachers report less of a need for professional development in subject matter and pedagogy in schools with lower levels of student mathematics anxiety, while an opposite relationship between these variables appears to exist in Spain. Unlike mathematics teachers in Australia, mathematics teachers in Spain report an increased need for professional development in subject matter and pedagogy in schools with a higher level of student mathematics anxiety.

Student truancy tends to not be related to mathematics teachers' reported need for professional development in subject matter and pedagogy across countries. However, teachers reported significantly less of a need for this type of professional development in the Finnish schools where students reported a higher tendency to be late to school. This same relationship exists in Latvia with students skipping classes, and in Romania with the percentage of students who needed to repeat a grade.

Country highlights

Multilevel models were developed to examine relationships between the average student factors in the school and teachers' reported professional development outcomes from TALIS, when comparing female and male teachers. These models help to provide a closer look at the different relationships that exist in individual countries. For example, student outcomes may predict teacher outcomes differently for male and female teachers in some countries while in other countries there may be no gender differences. An example of an interaction effect is to look at, for instance, whether student attitudes affect male teachers differently than female teachers.

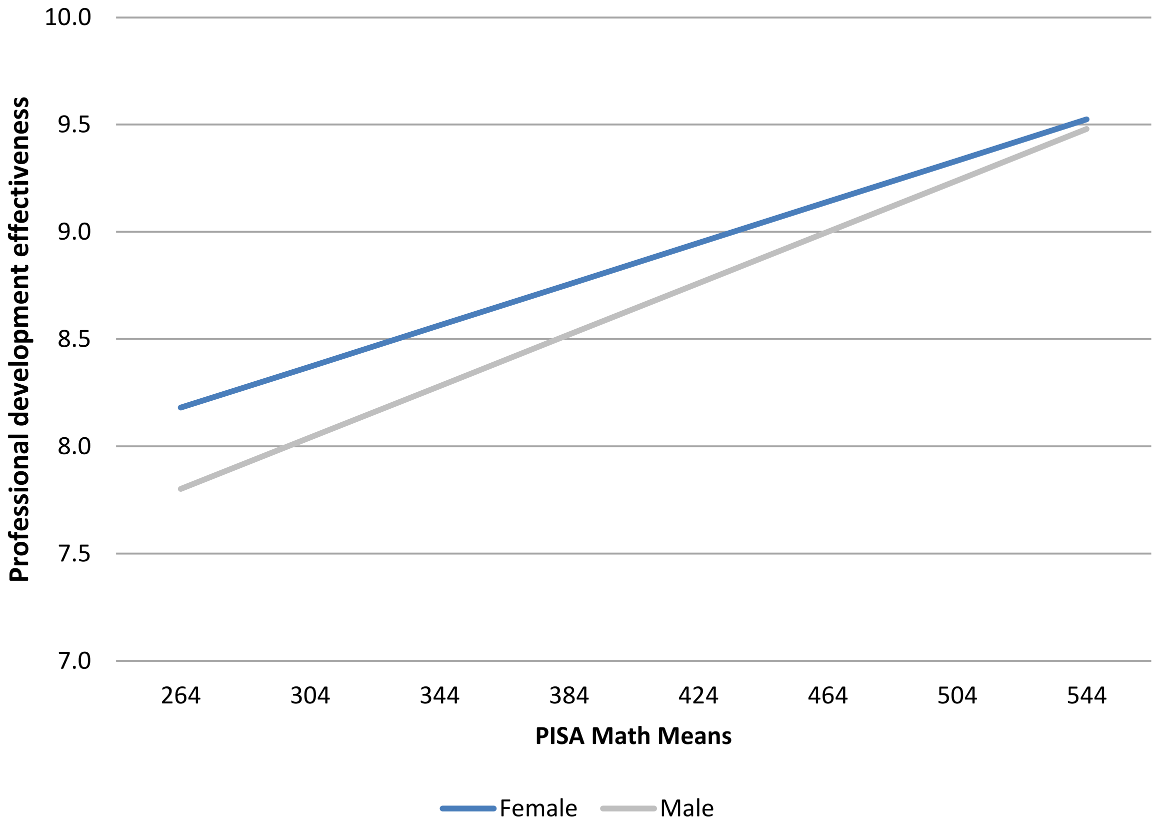
The following country-level profile highlights were selected to help illustrate that many of the relationships are much more complicated and interesting on an individual country level. Further research is needed to better understand the nature and implications of the relationships in each country.

Professional development perceived as effective

As shown in Figure 5, in Mexico, female teachers generally are more likely to report that the professional development in which they engaged includes characteristics indicative of effective professional development compared to their male counterparts. However, both male and female teachers in schools with high average mathematics achievement tend to report a higher number of effective professional development experiences compared to schools with lower average mathematics achievement.

Figure 5. Mexico: Professional development effectiveness

Male and female interaction with PISA mathematics school means - All teachers



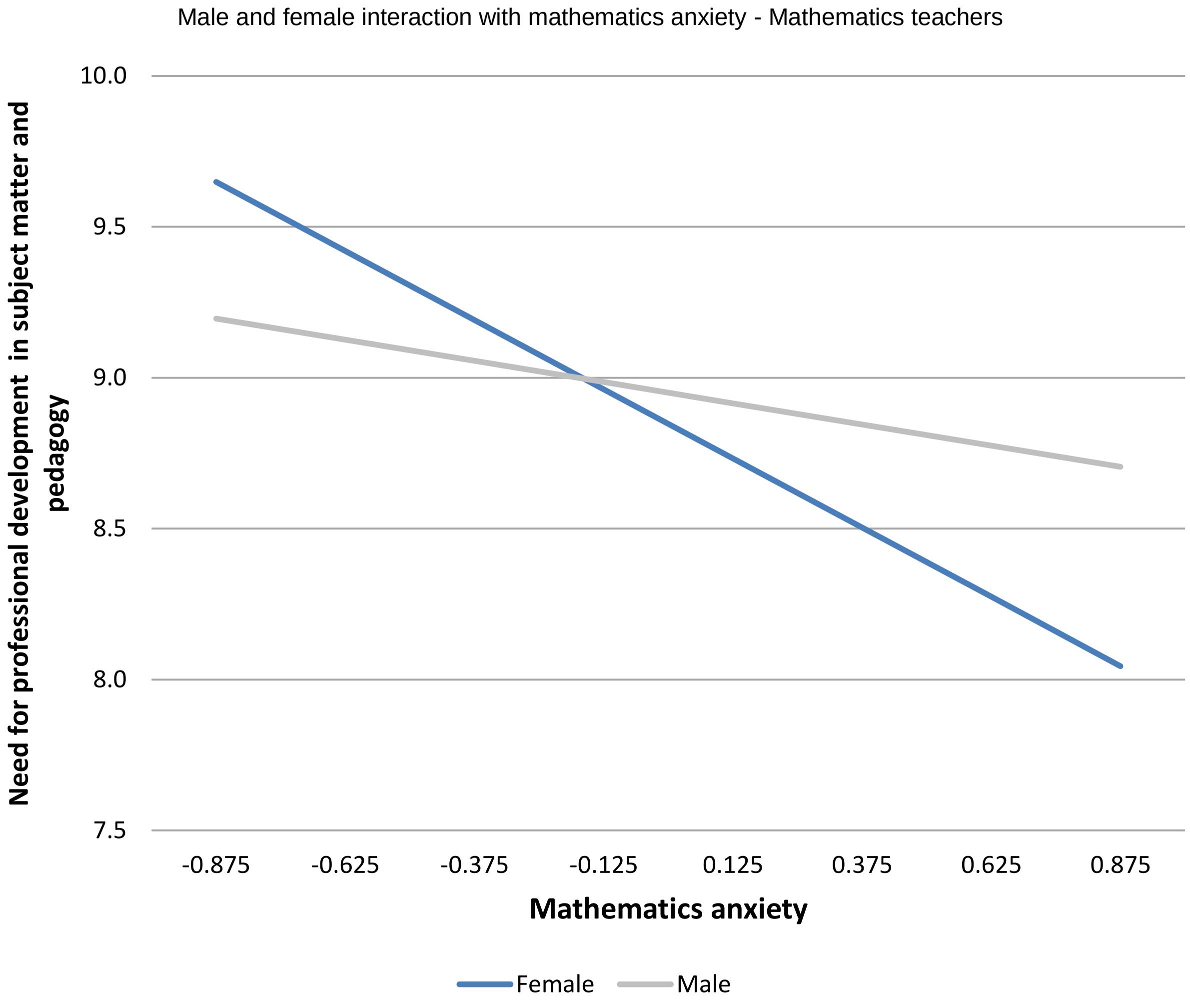
Source: OECD, TALIS 2013 and PISA 2012 databases.

Statistically significant interactions were also found in Singapore and Finland. In Singapore, there is a sharp decrease in the likelihood that male teachers will report that their professional development contained effective characteristics as the variability in mathematics achievement in the school increases. This pattern is not observed, however, for female teachers for which the reports on their professional development do not vary much depending on how variable students' mathematics achievement can be in the school. In Finland there is little relationship between the reported professional development effectiveness for female teachers and student sense of belonging to their school. However, there is a negative relationship for male teachers. Male teachers report fewer effective professional development characteristics in schools with a higher sense of student belonging compared with female teachers overall and compared to male teachers in schools with lower student sense of belonging.

Reported needs for professional development – subject matter and pedagogy

As shown in Figure 6, in Australia, both male and female mathematics teachers tend to report lower levels of need for professional development focusing on subject matter and pedagogy in schools where students report higher levels of mathematics anxiety. However, this pattern is even more pronounced for female teachers than it is for male teachers. Female mathematics teachers report less need compared to males in high anxiety schools than to males in low anxiety schools. This may be an indication that teachers who believe they are doing well in mathematics teaching may not be doing so well from their students' perspective.

Figure 6. Australia: Professional development need for subject matter and pedagogy



Source: OECD, TALIS 2013 and PISA 2012 databases

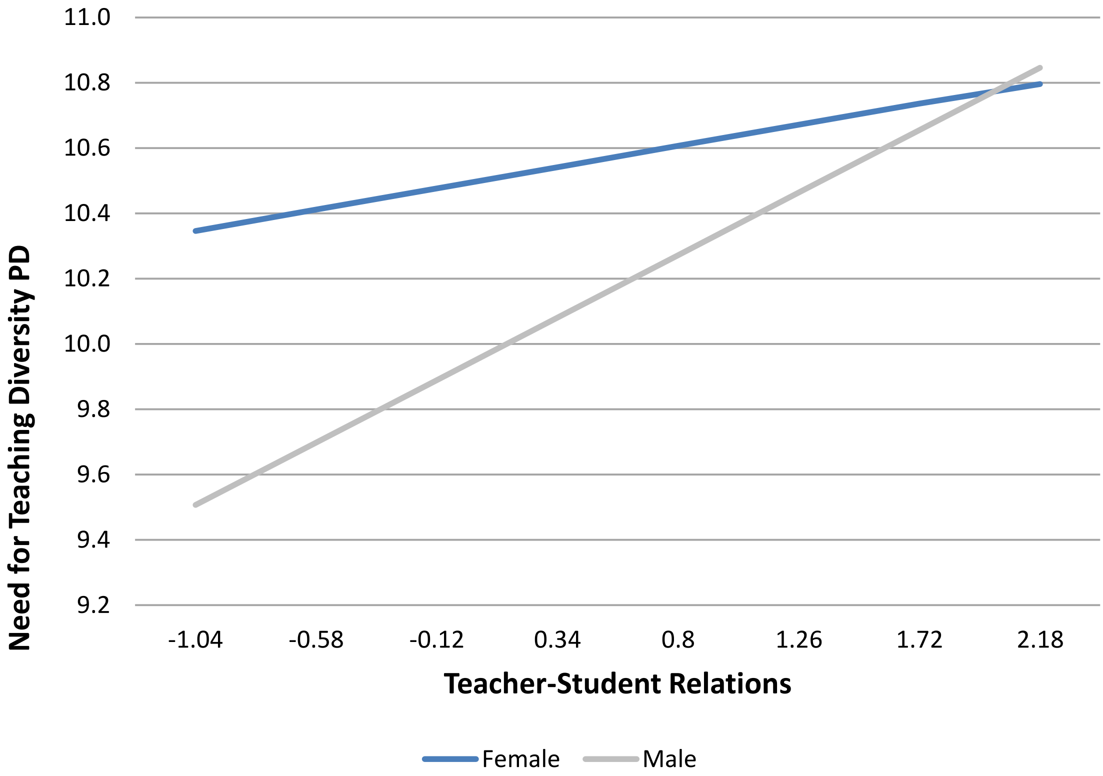
In addition, analyses revealed a common pattern of results in Mexico, Spain and Romania. Namely, in these countries in schools with higher ESCS, male teachers tend to report a higher need for professional development in subject matter and pedagogy than females, while the opposite is true in schools with lower ESCS, where female teachers report a higher need for professional development than males. Moreover, overall, an increase in ESCS variability is associated with decreased needs for professional development among female mathematics teachers but increased needs among male mathematics teachers. This finding suggests that in Mexico, male and female teachers have different reactions to diversity in their schools in terms of recognising their need for professional development. Analogical patterns have also been found in Spain and Romania.

Reported needs for professional development – teaching for diversity

Figure 7 illustrates that in Portugal, male teachers in general tend to report less of a need for professional development for teaching for diversity compared to women. However, for both male and female teachers, there seems to be a positive association between teacher-student relations and the expressed need for additional professional development for teaching for diversity.

Figure 7. Portugal: Professional development need for teaching for diversity

Male and female interaction with teacher student relations - All teachers



Source: OECD, TALIS 2013 and PISA 2012 databases.

Analyses revealed statistically significant interactions bewteen teacher gender and need for professional development in teaching for diversity in Australia and Latvia as well. In Australia, there is a positive association between teacher-student relations and female teachers' expressed need for additional professional development for teaching for diversity. However, there appears to be little or no difference in this need for male teachers regardless of the level of teacher-student relations. In Latvia there is a marked difference in the relationship between male and female teachers' reports for the need for more professional development for teaching for diversity and the variability of student ESCS. Female teachers exhibit little difference in their reported need for professional development in this area in schools with different levels of student ESCS variability. Male teachers, on the other hand, report less of a need for professional development for teaching for diversity in schools with higher economic variability than females, but they report about the same need for this professional development as females in schools with lower economic variability.

SECTION 5: TEACHING PRACTICES, BELIEFS AND TEACHER COOPERATION

This section provides information on how the school profiles of student variables relate to teachers' beliefs and practices. School profiles of student performance are examined in relation to teaching practices and collaboration to highlight the complex interactions between teacher-and-student relationships across countries. These analyses also emphasise the variability that exists across learning environments and the subject matter taught, with a special focus on mathematics.

Profiles of teacher beliefs

The report TALIS 2013 Results: An international perspective on teaching and learning (OECD, 2014b) explored the various influences on the practices and behaviours that teachers exhibit during their classroom teaching. This report examines many of those factors for the eight countries that participated in this study, but also adds PISA student variables to the analyses. Hence, the present section aims to bring insight to the relationships between student characteristics and teachers' practices and beliefs. For example, does the socio-economic status, attitudes or motivation of students in the class have any relationship with how teachers teach? This section examines these relationships for teachers of all subject areas and for teachers of mathematics.

Table 17 presents the percentages of teachers who report using each of the eight teaching practices. Teachers with high constructivist teaching beliefs are contrasted with teachers who reported low constructivist beliefs. Box 10 provides a description of the items that are used to make up the constructivist beliefs measure as well as general-domain teaching practices and mathematics teaching practices. The associated figures also show the relationship between high or low constructivist beliefs and teaching practices among the eight countries that participated in this work.

Box 10. Teacher beliefs and practices

Teaching beliefs and practices from the TALIS data set were examined (Tables 17 – 21). An index scale of constructivist teaching beliefs was provided with the data set (TBCONSB). This scale was constructed from the items in the teacher questionnaire detailed below. Additionally, mathematics teacher strategies and practices from the mathematics teacher questionnaire were examined, including their use of ICT.

Constructivist teaching beliefs:

- My role as a teacher is to facilitate students' own inquiry.
- Students learn best by finding solutions to problems on their own.
- Students should be allowed to think of solutions to practical problems themselves before the teacher shows them how they are solved.
- Thinking and reasoning processes are more important than specific curriculum content.

Teaching practices

- I present a summary of recently learned content.
- Students work in small groups to come up with a joint solution to a problem or task.
- I give different work to the students who have difficulties learning and/or to those who can advance faster.
- I refer to a problem from everyday life or work to demonstrate why new knowledge is useful.
- I let students practice similar tasks until I know that every student has understood the subject matter.
- I check my students' exercise books or homework.
- Students work on projects that require at least one week to complete.
- Students use ICT (information and communication technology) for projects or class work.

Mathematics teacher teaching practices:

- I have students work in groups.
- I have students complete a test or quiz.
- I explicitly state learning goals.
- I ask short, fact-based questions.
- I expect students to explain their thinking on complex problems.
- I give students a choice of problems to solve.
- I connect mathematics concepts and teach their use outside of school.
- I encourage students to solve problems more than one way.
- I require students to provide explanations of how they solve problems.
- I require students to work on projects that take more than a class period.
- I go over homework problems that students were not able to solve.
- I encourage students to work together to solve problems.

Box 10. Teacher beliefs and practices *(continued)*

Types of ICT used by mathematics teachers:

- drill and practice software
- topic-specific software
- spreadsheets or other data analysis software
- software for assessing student learning
- internet resources.

Mathematics teachers' estimate of the time they expected an average student in the survey target class to work on homework was also examined.

Table 18 highlights two classroom strategies used by mathematics teachers: placing students in groups and assigning them a test or quiz. Research indicates that quizzes and practice tests are powerful learning techniques (Adesope & Trevisan, 2013; Dunlosky Rawson, Marsh, Nathan, and Willingham, 2013). In 7 of the 8 countries surveyed, a majority of mathematics teachers report being at least somewhat likely to have students work in groups. Finland is the lone exception to this pattern. In Mexico, student group work in mathematics is by far the most common among the participating countries. Teachers' responses are similar regarding having their students complete a test or quiz. Again, a majority of teachers are likely to use this classroom strategy in all participating countries except Finland, and Mexico has the highest proportion of teachers who are very likely to use the strategy.

Mathematics teachers' perception of how much time should be spent on homework is also presented in Table 18. Most mathematics teachers expected their students to spend somewhere between 16 and 60 minutes on homework assignments, except in Finland, where the majority of teachers expected homework to take their students less than 15 minutes. On the high end, over 60% of mathematics teachers in Romania and Singapore expected their students to spend more than 30 minutes on homework. Table 19 presents teaching practices used by mathematics teachers in their target class. In other words, teachers were asked to think of a class they taught in the previous week that would be representative of their teaching practices in general. Across countries, mathematics teachers consistently report that they very frequently explicitly state learning goals; ask students short, fact-based questions; and review difficult homework problems. At least 34% of mathematics teachers reported employing these practices even more frequently -- in all or nearly all their lessons. Consistent across countries is a lack of use of projects requiring students to work on for more than a class period. Similarly, teachers rarely give students a choice of problems to solve, except in Finland where nearly one third of mathematics teachers (32%) report doing this in all or nearly all lessons. Table 20 details the types of ICT used by mathematics teachers for their target class. Most of these practices are used infrequently by teachers across all eight countries, in particular in Finland and Romania. Use of internet resources appeared to be the only type of ICT that is used frequently by a near majority of teachers in some countries (e.g. Australia, Latvia, Mexico and Portugal). These results indicate that there is still an untapped potential in most countries in terms of teachers' application of ICT tools to improve teaching and learning. The results are also in line with the TALIS 2013 findings (OECD, 2014b) showing that the use of ICT is one of the most needed areas in terms of teacher professional development.

Teaching practices

Logistic regression models were built to study the relationship between school profiles of student performance and teachers' reported practices in the classroom. Three teaching practices, identified as being student-centred active practices (see OECD 2014) are examined: the use of small groups, projects that require more than a week to complete, and the use of Information Communication and Technology (ICT). An international model is first developed to look at predictive trends across all eight of the PISA-TALIS countries. Secondly, models are developed for each individual country. Details on these models can be found in the technical appendix.

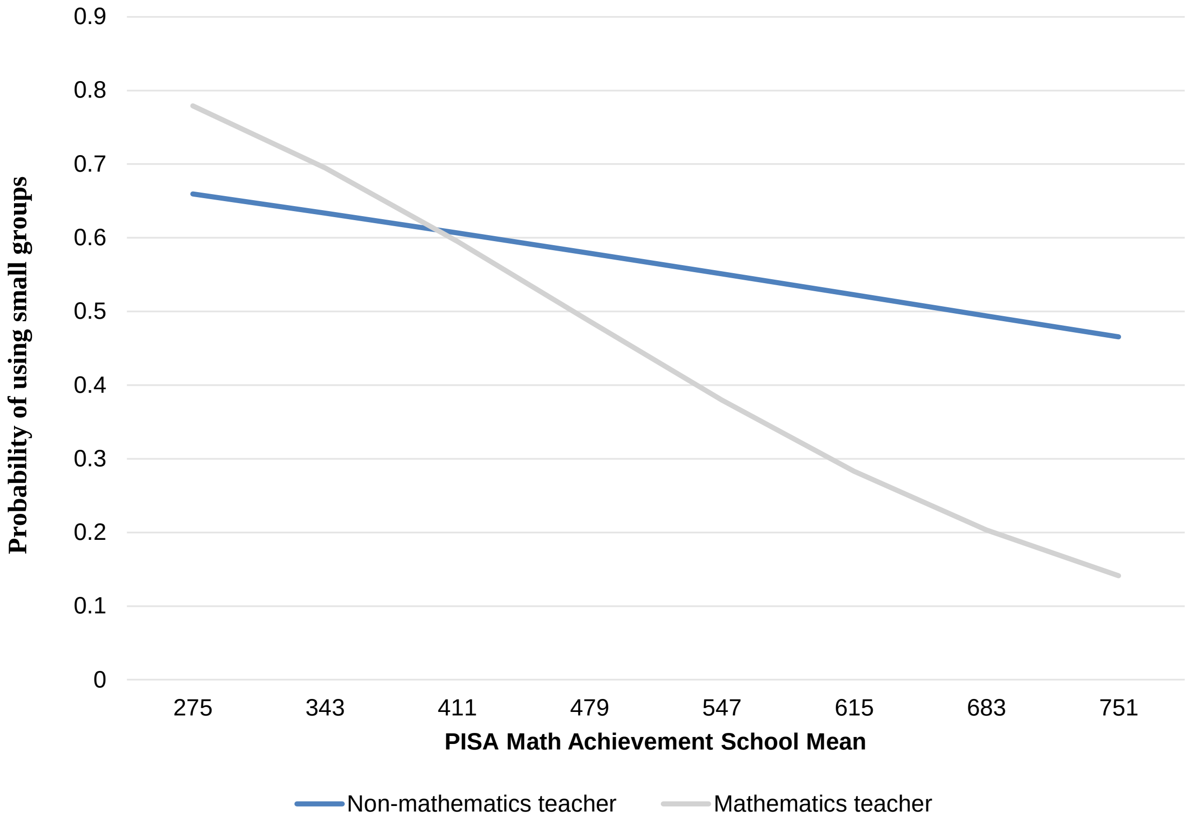
Factors related to using small groups in teaching

This section examines the different characteristics that appear to be related to whether teachers are more or less likely to put students into small groups for their work. There is a difference in the probability of using small groups as a teaching practice between male and female teachers across the eight TALIS-PISA countries, depending on schools' average socioeconomic status of students. Overall, female teachers' use of small groups teaching practice increases slightly with increasing ESCS, while male teachers' sharply decreases. In schools with higher ESCS student populations, male teachers are much less likely to use small groups compared with female teachers. This trend is reversed, however, in schools with low ESCS student populations.

Figure 8 illustrates the relationship between the average PISA mathematics achievement and the use of small groups among mathematics and all teachers. Overall, the influence of mathematics achievement on all teachers' use of small groups, across the eight countries, appears to be small; however there is a slight decline in the use of this method as the student achievement level increases. Mathematics teachers' use of small group is related to student achievement to a greater extent, and there is a strong decline in the use of small groups with increasing PISA scores. The findings indicate that teachers in all subjects combined are more likely to use small groups than mathematics teachers in high-performing schools, while the opposite is true in low-performing schools. The use of small groups in lower-performing schools could be a reflection of teachers' drive to improve their students' performance in mathematics. Indeed, extant research shows that small groups can be an effective tool in teaching mathematics (Springer et al., 1999).

Figure 8. Use of small groups by PISA mean achievement in mathematics

Probability of mathematics or all teachers using small groups by PISA school mean achievement in mathematics - All TALIS-PISA link teachers

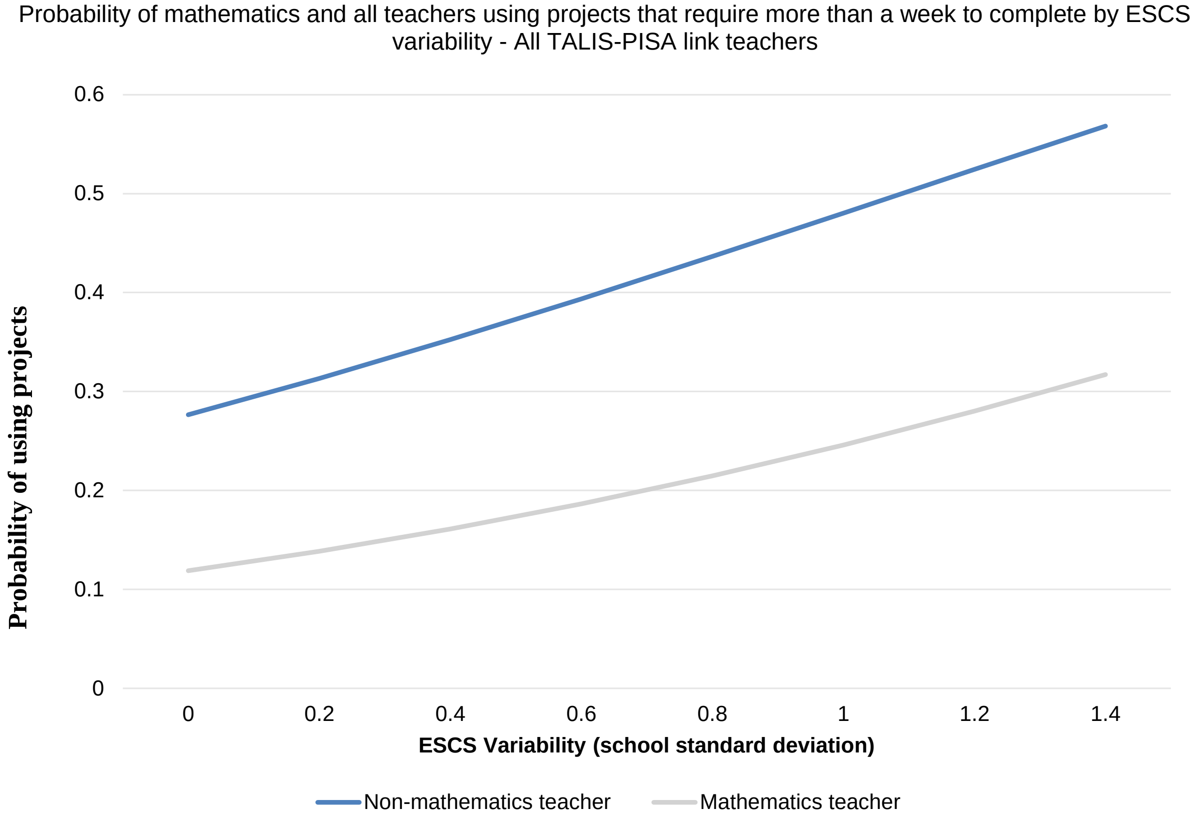


Source: OECD, TALIS 2013 and PISA 2012 databases.

Use of long-term projects as a teaching practice

Figure 9 shows a difference between mathematics and all teachers in their probability of using long-term projects, specifically those that require more than a week to complete, depending on the socioeconomic profile of their schools. Both sets of teachers appear more likely to use this practice in schools with greater ESCS variability among their students. Teachers are less likely to use this practice in more economically homogeneous schools, regardless of whether those schools have a predominantly high or low ESCS.

Figure 9. Use of projects that require more than a week to complete by school ESCS variability

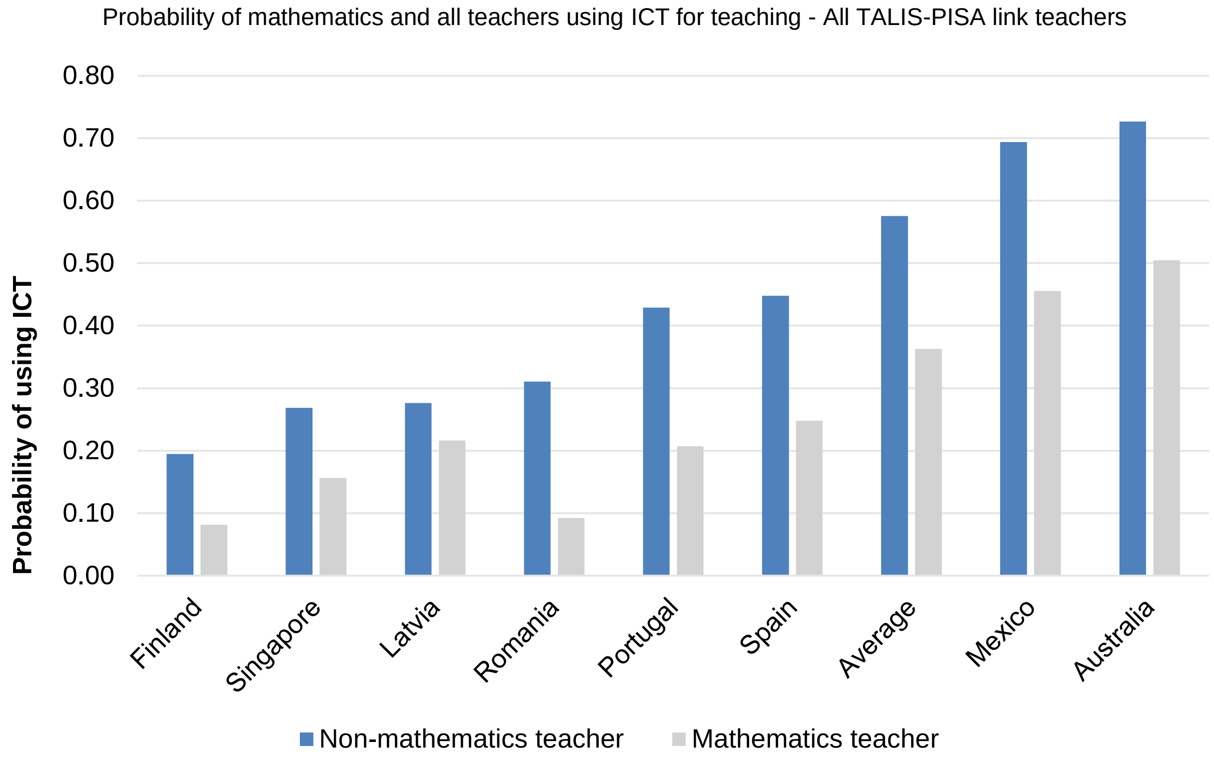


Source: OECD, TALIS 2013 and PISA 2012 databases.

Use of Information and Communication Technology (ICT)

Figure 10 shows the differences in the probability of mathematics and all teachers to use ICT for each of the eight TALIS-PISA countries. Teachers in all subjects combined appear to be much more likely than mathematics teachers to make use of ICT across the eight countries in this study. The probability of all teachers to use ICT is more than one and a half times greater than that of mathematics teachers. Teachers in Australia and Mexico in particular report above-average use of ICT.

Figure 10. Probability of using ICT for teaching



Source: OECD, TALIS 2013 and PISA 2012 databases.

How are teachers teaching: Country-level analyses

The previous sections highlighted some of the student and teacher factors that are associated with teachers' choice of practices. These components were then used in models to investigate trends in teaching practices at a country level. Additional student level variables are included in these models (see the technical annex). The focus of these analyses is on understanding how students' attitude toward school, their sense of belonging, and their relationships with teachers are related to the teachers' use of the three teaching practices highlighted previously. Also of interest is teacher gender, years of experience and how these variables interact with the student-level variables in understanding teachers' use of those practices. With the growing focus on non-cognitive student variables in understanding the learning environment (Caprara, Barbanelli, Pastorelli, Bandura, and Zimbardo, 2000; Sedlacek, 2011), it is possible that these interactions could reveal trends across countries highlighting the relationship between student attitudes and feelings and teacher practices in the complex classroom learning environment.

The following sections focus only on interactions that are significant in the analyses. The figures that follow compare two countries that show trends in the data as well as cases that are quite different from these trends. These are highlighted to show the differences that exist in predicting the probability of teachers engaging in such practices.[2] Many of these figures also compare the results for mathematics

[2] The outcome measure (Y-axis) in Figure 13, for example, consists of the probability that a respondent will use a teaching practice frequently or all the time (as opposed to never or occasionally). These interaction figures are produced using country-centred data. Effects should be interpreted as the relationships between the modelled variables while all other effects are held at their average.

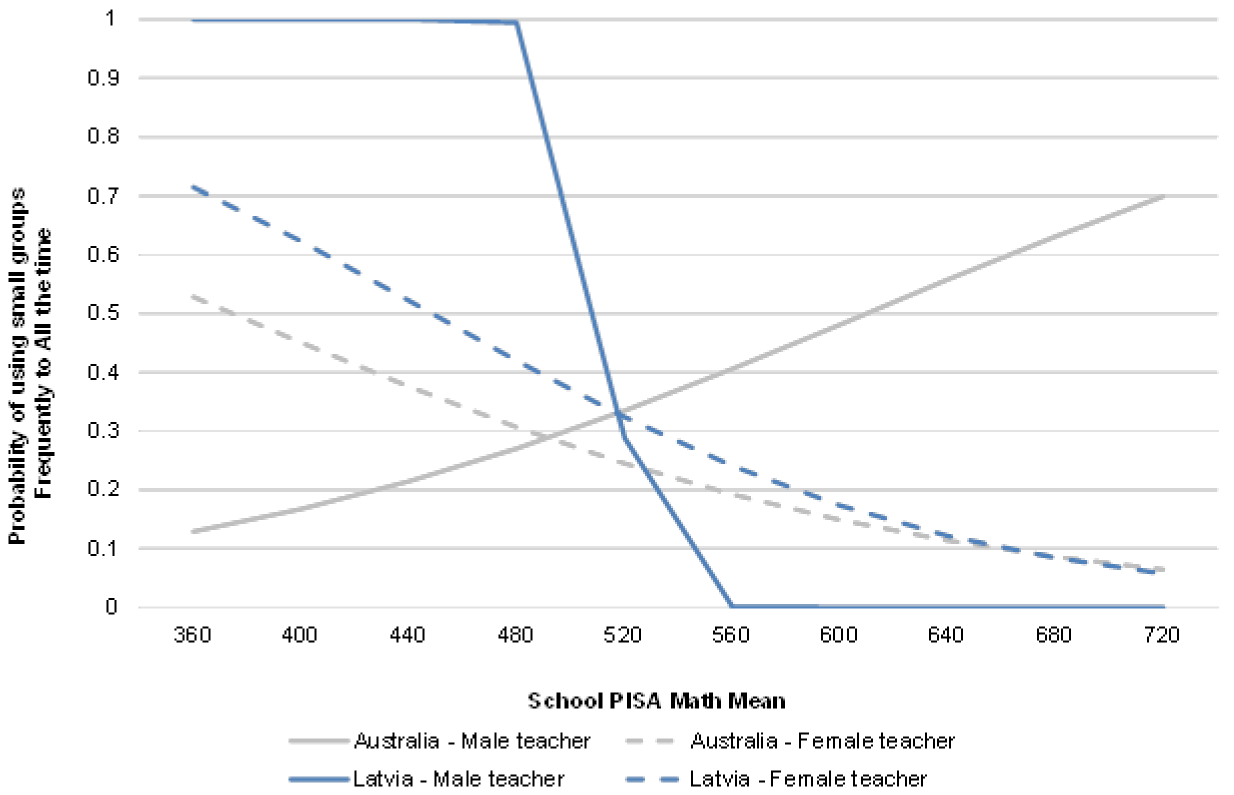
teachers and all teachers of all subjects combined. This allows examination of mathematics teachers using homogenous instruction as compared to teachers of all subject matters (e.g. Stodolsky, 1984).

Use of small groups

Figure 11 illustrates that male and female mathematics teachers in Australia differ in their use of small groups depending on the average school performance of their students based on the PISA mathematics score. The probability of male mathematics teachers using the small group teaching practice is much greater compared to the one of their female mathematics teacher counterparts in schools with high PISA mathematics achievement. This trend reverses in schools with low PISA mathematics achievement with females being much more likely than males to make use of the small group teaching practice. This trend is common in Mexico and Singapore as well. However, for most mathematics teachers the probability of using small groups is less than 50% except in the highest achieving schools. In Australia less than 5% of teachers work in schools with an average PISA mathematics school greater than 600. In contrast, in Latvia, male and female teachers are not likely to use small groups as a practice with students in schools with high mathematics scores; yet they are more likely to use this practice with lower achieving students.

Figure 11. Australia and Latvia: Use of small groups by PISA mathematics school mean

Probability of make and female teachers of using small groups by PISA mathematics school mean in Australia and Latvia - Only mathematichs TALIS-PISA link teachers



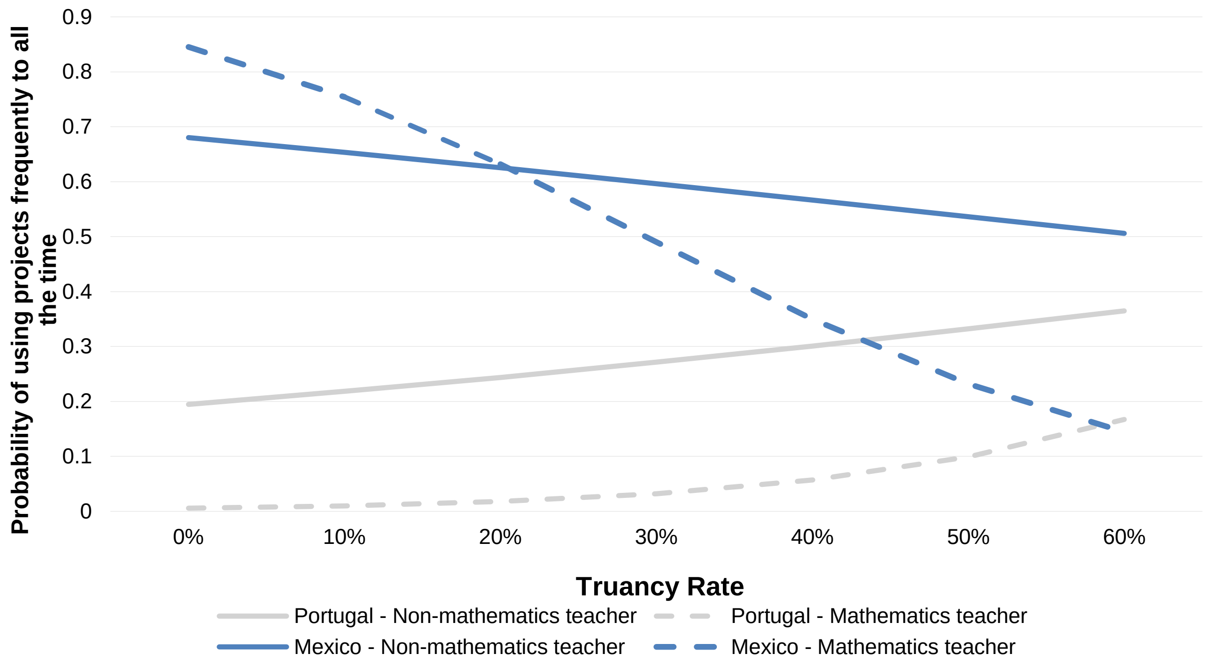
Source: OECD, TALIS 2013 and PISA 2012 databases.

Use of long-term projects

The following analyses focus on the relationship between the use of projects lasting more than a week and students' truancy rates to investigate whether mathematics and all teachers in schools with high truancy rates are more or less likely to assign long-term projects to students (See Figure 12). A higher rate of truancy with long-terms projects could be interpreted in a number of ways. For example, if a student is working on a long term project, perhaps they are permitted to occasionally skip class or make use of time outside the classroom for research on their topic. Or, does the use of such projects encourage students to skip class for less positive reasons such as a feeling that their work is more dependent on the project than the lecture. In Portugal, while mathematics teachers are much less likely than teachers of all subjects combined to make use of projects that require more than a week to complete, all teachers seem to make more use of this practice in schools with higher average truancy rates. Teachers of all subjects in Portugal, however, have about 35% likelihood of making use of this teaching practice in the highest average truancy rate schools. This trend also occurs in Romania (See also Table 21). In contrast, in Mexico, the general trend is negative with increase in truancy rates decreasing the probability of use of persistent projects as a practice for both mathematics teachers and teachers of all subjects combined. The decline is steeper for the mathematics teachers compared to all teachers.

Figure 12. Mexico and Portugal: Probability of using projects that require more than a week to complete by truancy rate

Probability of mathematics and all teachers of using projects that require more than a week to complete by truancy rate for mathematics and all teachers in Mexico and Portugal



Source: OECD, TALIS 2013 and PISA 2012 databases.

Further investigation in Portugal and other countries in which there is a positive relationship between long-term projects and truancy is needed. It is unclear whether teachers in these countries implement such practices in order to improve student engagement or if the opposite is true. The question should also be asked as to whether such truancy is permitted as part of a school culture. Results such as those which appear in Mexico could help give insight to why such trends exist. In general, investigating malleable factors, such as truancy, which can influence teachers' use of teaching practices could inform future interventions aiming to make these teaching practices more effective.

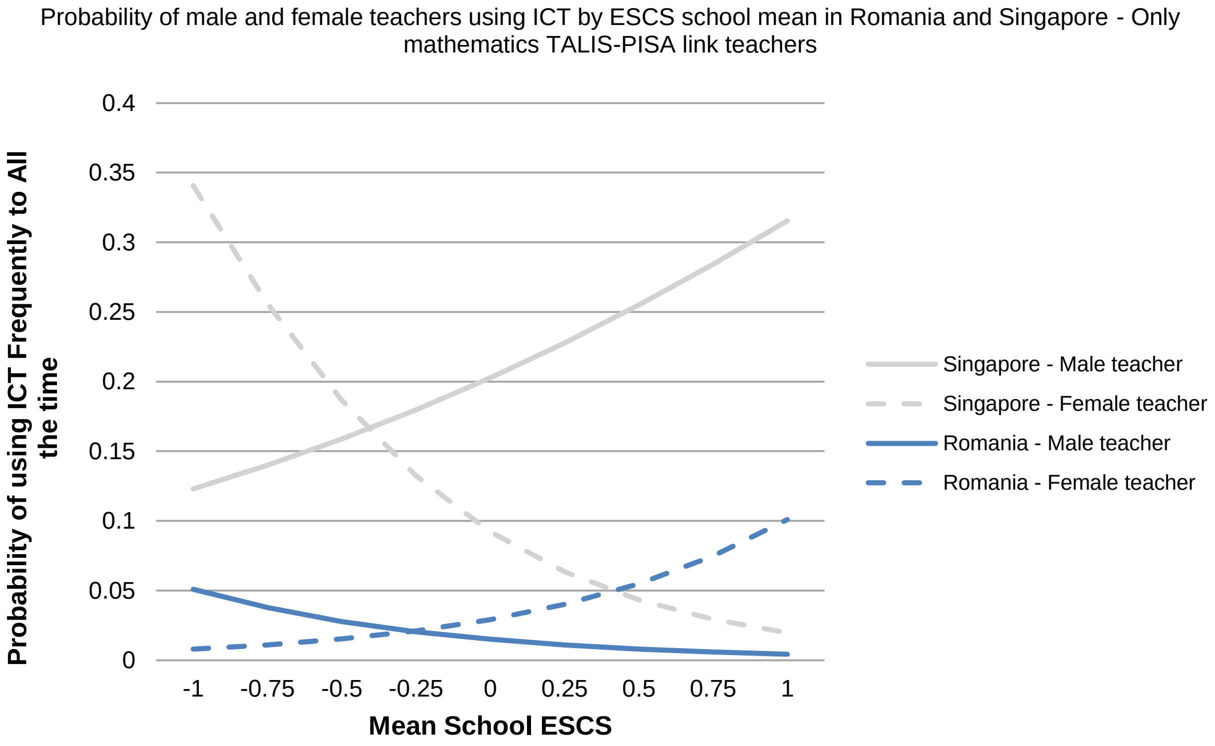
Use of Information and Communication Technology (ICT)

A positive classroom climate can correspond to a greater likelihood of using teaching practices involving ICT. Positive climates may be more difficult to maintain in schools or classrooms with higher poverty rates and thus the use of ICT may not be as great with teachers in such environments. Additionally, schools in areas with higher ESCS might also be under-resourced and might have less access to the tools necessary to teach with ICT. Thus, the connections between ICT use and school ESCS were examined.

It is encouraging to see that the average school ESCS appears to have no significant effect on the probability of female teachers making use of ICT in Finland. However, there is a significant change in the likelihood of using this practice among male teachers in schools with higher ESCS levels as compared to lower ESCS schools. Male teachers in schools with low average ESCS among its students tend to have a much greater probability of making use of ICT compared to female teachers in the same schools or either group of teachers in higher ESCS schools. The same trend with male teachers is observed in Portugal although their probability of implementing ICT is high in general compared to Finland. Moreover, female teachers in Portugal tend to use ICT more in schools with higher ESCS, in contrast to their male counterparts. More research is needed to understand the differing dynamics of ICT use for male and female teachers in schools at different levels of ESCS.

Figure 13 illustrates a distinct difference in probability patterns for male and female mathematics teachers' use of ICT in Singapore and Romania. Female mathematics teachers in schools with above average ESCS are much less likely to make use of ICT compared to female mathematics teachers in lower ESCS schools. In addition, male mathematics teachers across the ESCS spectrum seem to make more use of ICT. Male and female mathematics teachers also differ in the fact that male teacher use of ICT has a positive relationship with average school ESCS whereas female teachers appear to decrease their use of this practice in higher ESCS schools. The opposite trend can be seen in Romania. Further research might make use of a micro level examination as to why teachers across the various countries select to use ICT in more or less complex learning environments, as well as why male and female teachers differ on the use of this practice. As the use of technology in the classroom will continue to increase in the next decade, teaching using ICT will likely only increase in its importance.

Figure 13. Romania and Singapore: Probability of mathematics teachers using ICT by ESCS school mean

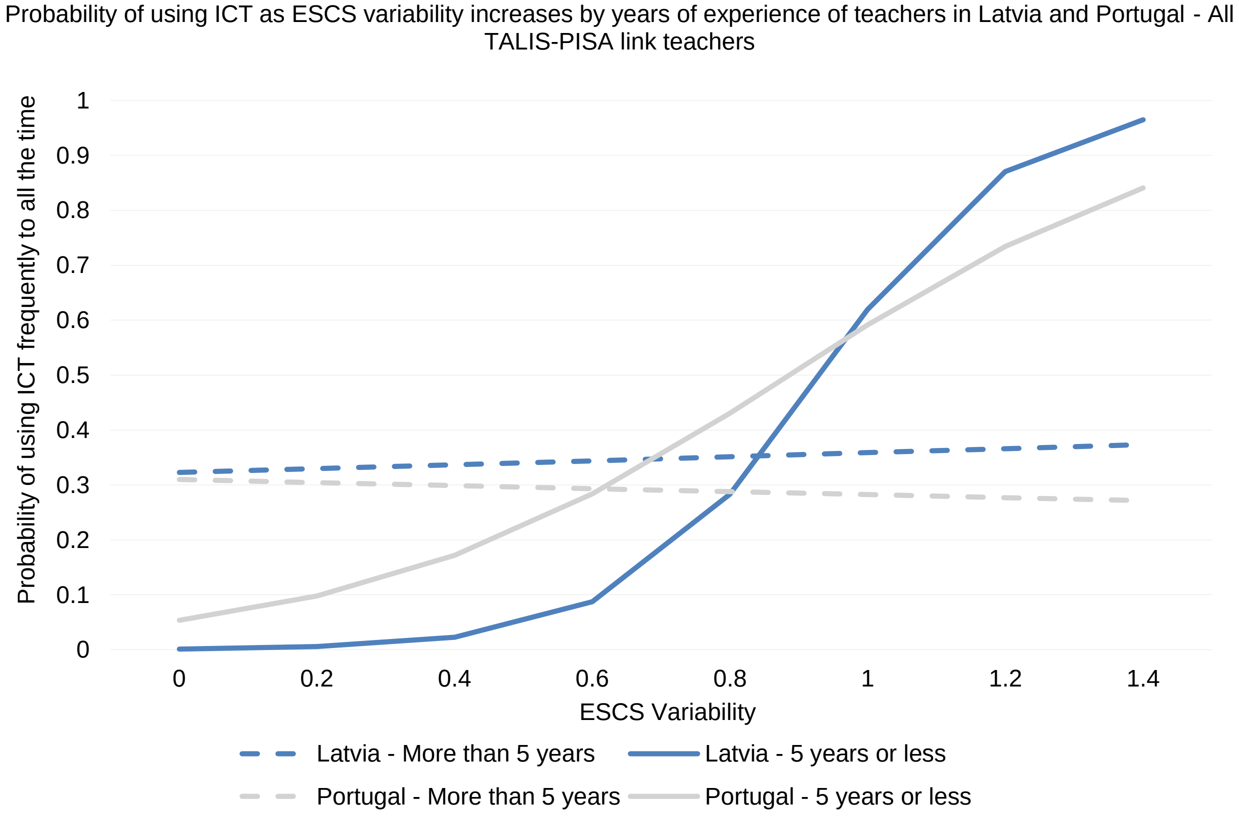


Source: OECD, TALIS 2013 and PISA 2012 databases.

The interplay between ICT use by teachers and student ESCS is further explored by considering two groups of teachers: those with less and more than five years of experience. Schools with high ESCS variability among their students are likely to have students from both high ESCS and low ESCS families, while schools with low ESCS variability have students that are rather similar in ESCS traits throughout the school. It is important to keep in mind that low ESCS variability can exist in schools that have an average ESCS value that is high, medium or low.

Figure 14 displays the relationship in Latvia and Portugal between teachers' years of experience and the likelihood of using ICT in schools with different levels of ESCS among their students, with the interaction in both countries following a similar pattern. Namely, teachers with more than 5 years of experience are not any more or less likely to change their practice based on ESCS variability in the school in which they teach. Teachers with less than 5 years of experience, however, display great differences in their likelihood to make use of ICT between low and high variability schools. Teachers with less than 5 years of experience in low-variability schools tend to exhibit no increase in the probability of using ICT compared with similar teachers in higher-variability schools, who make more use of ICT. This may coincide with the findings reported previously indicating that males have a higher probability of using this strategy in schools with low ESCS. Again, the reason for such use in such environments may be a coping strategy in the form of technology to assist teachers in more challenging environments.

Figure 14. Latvia and Portugal: Probability of using ICT as ESCS variability increases



Source: OECD, TALIS 2013 and PISA 2012 databases.

Teacher collaboration and exchange

This section examines teacher collaboration and exchange through the use of multilevel models. The collaboration and exchange between teachers is critical, and the effectiveness of cooperative practices depends on the structure of the collaboration (Clement and Vandenberghe, 2000). Indeed, schools should encourage a positive school climate with healthy collaboration between teachers, students, families, and staff. These analyses attempt to shed light on how student and school-level variables explain teacher collaboration and exchange. As in the previous section, significant interactions are the focus with the goal of highlighting trends across countries or counter examples between countries to understand the complex learning environment in which teachers work and how they are influenced by their surroundings. Box 11 describes the items that made up the measures used as the dependent variables in the teacher collaboration and exchange models. Refer to the technical appendix for detailed descriptions of the models, including the independent variables as well as the interaction effects that are tested.

Box 11. Dependent Variables

Two dependent variables were used in this analysis. Exchange and coordination for teaching (TCEXCHS) and professional collaboration (TCCOLLS). These index scales were made up of items from the TALIS survey. Two examples, for each scale, of the items that made up these index variables are given below:

Exchange and coordination for teaching:

- Exchange teaching materials with colleagues.
- Engage in discussions about the learning development of specific students.
- Work with other teachers in my school to ensure common standards in evaluations for assessing student progress.
- Attend team conferences.

Professional collaboration:

- Teach jointly as a team in the same class.
- Observe other teachers' classes and provide feedback.
- Engage in joint activities across different classes and age groups (e.g. projects).
- Take part in collaborative professional learning.

Because the overall indices did not reach scalar invariance (see Appendix B of the TALIS 2013 main report), it is not possible to directly compare scores between countries (OECD, 2014b).

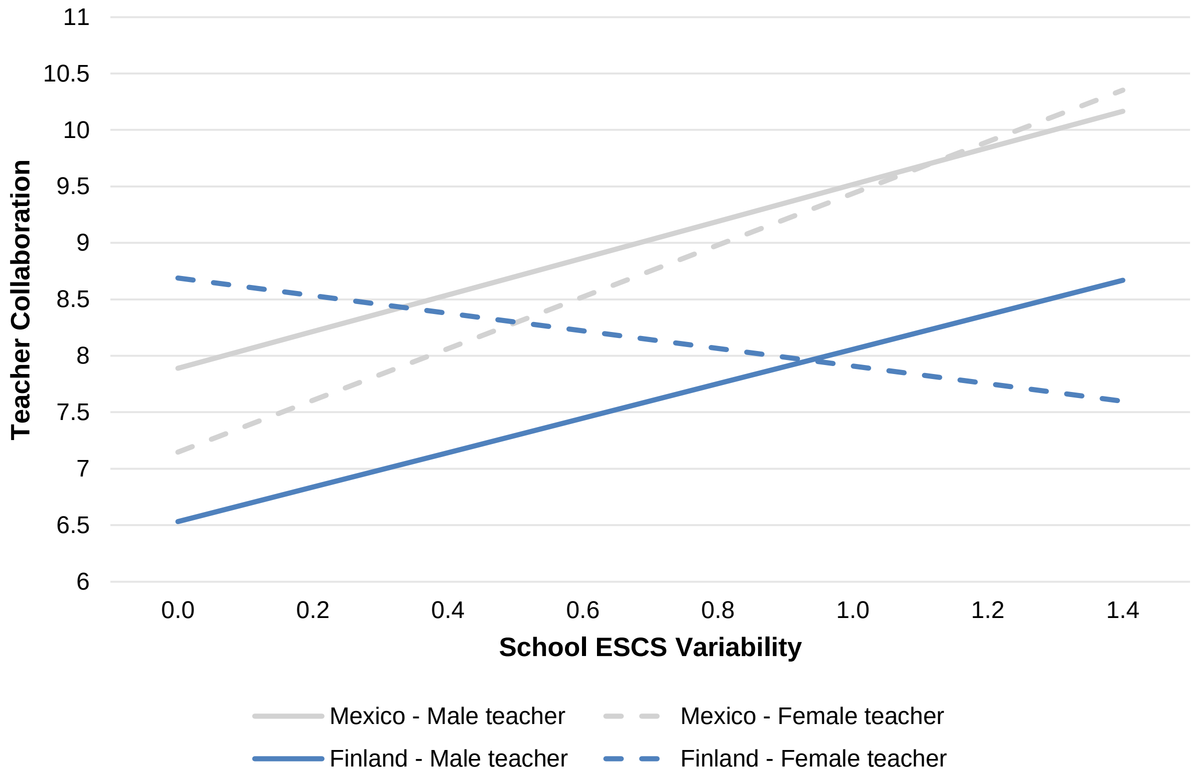
In Australia, the data indicate a significant, although small, difference in the amount of collaboration between mathematics teachers versus teachers of all subjects combined. Both types of teachers report less collaborative behaviour in schools with higher PISA mathematics achievement. This overall trend is seen across Mexico, Portugal, Romania, and Spain. Interestingly, in Finland the declining trend is the same, yet the rate of collaboration between all teachers is lower when compared to mathematics teachers with lower achieving students. The overall trend may be an indication that teachers feel a stronger need to take action, such as collaboration, in schools with lower PISA scores in order to boost student performance. In turn, there may be less of a perceived need for this in schools with more successful students.

To further examine the use of collaboration in diverse environments, the interaction between mathematics teacher gender and ESCS is investigated (see Figure 15).[3] There is a slight difference in reported teacher collaboration between male and female teachers in Mexico as ESCS variability changes in schools. There is a positive relationship between collaboration practices and ESCS variability for both genders. However, female teachers in Mexican schools with higher ESCS variability tend to report slightly greater collaboration with their peers than male teachers, and vice versa for low-variability schools. However, in Finland, male mathematics teachers engage in collaboration to a greater extent as ESCS variability increases whereas their in-country female counterparts collaborate less under the same conditions. Teachers in schools with a greater range of ESCS tend to report more collaboration than teachers in schools with a narrow distribution of ESCS, with the exception of female teachers in Finland.

[3] High values on the X-axis indicate good student attitudes while low X-axis values indicate poor attitudes toward school.

Figure 15. Finland and Mexico : Mathematics teacher collaboration and ESCS variability

Female and male teacher collaboration by ESCS variability in Finland and Mexico - All TALIS-PISA link teachers

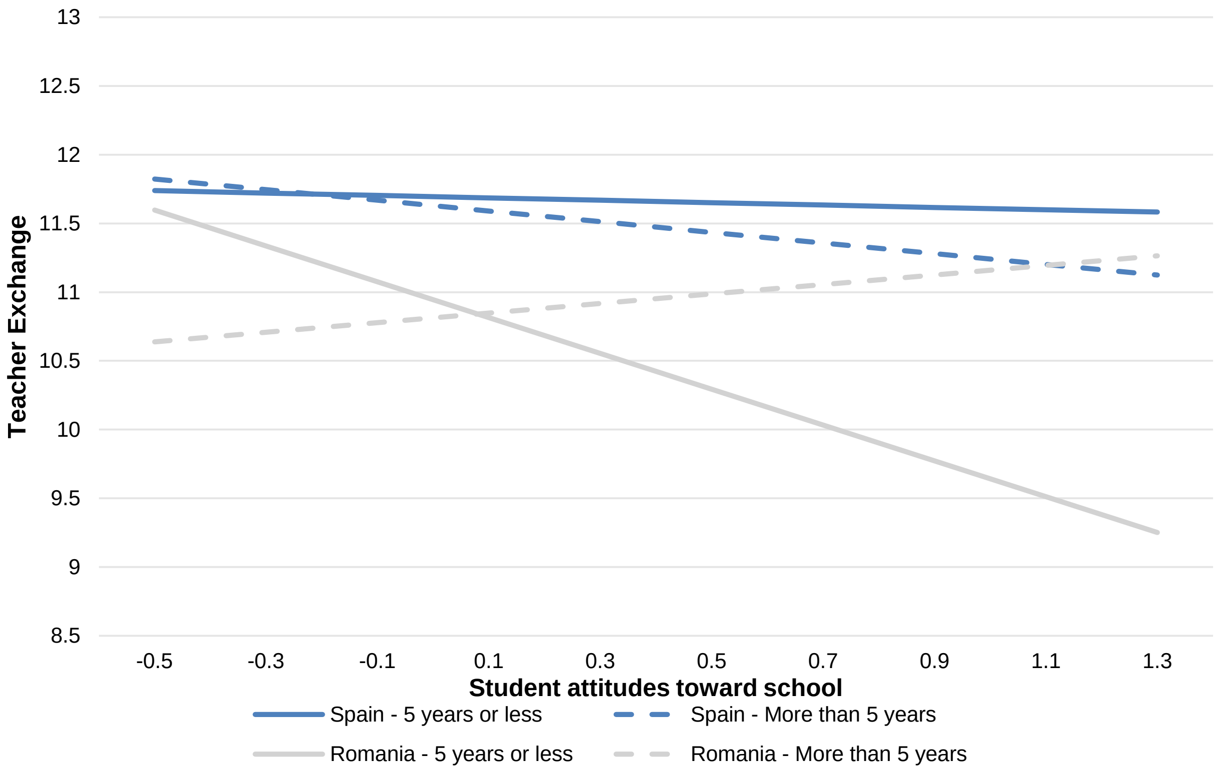


Source: OECD, TALIS 2013 and PISA 2012 databases.

In Spain, teachers with more than 5 years of experience tend to participate less in teacher exchange activities than teachers with less experience (See Figure 16). This result may reflect that teachers with less experience are more likely to rely on their colleagues for help and guidance. Less experienced teachers tend to report the same level of exchange behaviour regardless of the average student attitude toward school. Meanwhile teachers with more than 5 years of experience tend to report less exchange behaviour in schools with good student attitudes than teachers in schools with bad student attitudes. Interestingly, teachers with less than 5 years of experience report about the same level of exchange in all schools regardless of student attitude. Somewhat in contrast, teachers in Romania with more than 5 years of experience tend to have more exchange as student attitudes become more positive whereas the less experienced teachers show a sharp decline in exchange practices as student attitudes are more positive. It could be that the less experienced teachers sense this positive attitude in the classroom and take this as a sign things are going well and do not need to engage in exchange as much as when they sense students are not satisfied with school or class. Research has shown that teachers cement their practices and form habits after 5 years in the profession (Darling-Hammond, 2000). Given that the results show that in some countries new teachers do not engage in collaboration, policy at a national and school level should raise awareness as to the importance of collaboration and exchange practices amongst new teachers in particular.

Figure 16. Romania and Spain: Teacher exchange and student attitudes

Teacher exchange and student attitudes by years of experience of teachers in Romania and Spain - All TALIS-PISA link teachers



Source: OECD, TALIS 2013 and PISA 2012 databases.

SECTION 6: TEACHER SELF-EFFICACY AND JOB SATISFACTION

This section examines the possible associations between different aspects of teacher self-efficacy and job satisfaction and characteristics of their schools' student population. These characteristics are measured by looking at the school averages or variability on the following student dimensions measured in PISA: Economic, Social and Cultural Status (ESCS), student self-efficacy in mathematics, mathematics achievement, work ethic, sense of belonging, intrinsic motivation to learn mathematics, and attitudes toward school and learning activities. This section also examines whether the student factors in the schools differentially affect the self-efficacy and job satisfaction of teachers with different characteristics by examining interactions in multilevel models across the eight participating countries.

Country-specific multiple hierarchical linear regressions were conducted to examine which student variables (at the school level) appear to play a role in predicting or explaining teacher self-efficacy (see Box 12 for more information on linear regressions). As mentioned in Section 2, self-efficacy can be thought of in general terms (i.e. domain-general or subject-general) and researchers have also claimed that self-efficacy can be domain-specific (Bandura, 1986, Parker, Marsh, Ciarrochi, Marshall and Abduljabbar, 2014). TALIS measures both forms of self-efficacy. All teachers were asked about their sense of self-efficacy in areas such as student engagement, student instruction and classroom management. Moreover, TALIS surveyed mathematics teachers about their perceived abilities as mathematics teachers (See Box 13 for more information).

Box 12. Description of multiple linear regression analysis

For each country, five separate regressions were performed. The analyses controlled for teachers' age, years of experience and subjects taught. The five regressions used the following dependent variables:

- overall teacher self-efficacy (see Table 22)
- teacher self-efficacy in classroom management (see Table 23)
- teacher self-efficacy in instruction (see Table 24)
- teacher self-efficacy in student engagement (see Table 25)
- teacher self-efficacy in teaching mathematics (for mathematics teachers only, see Table 26).

Variables were inspected to determine which ones are related to these teacher self-efficacy outcomes. The variables included the following: student Economic, Social and Cultural Status (ESCS), student self-efficacy in mathematics, student mathematics achievement, student work ethic in mathematics, student sense of belonging, students' intrinsic motivation to learn mathematics, students' attitude toward school and learning activities.

Box 13. Description of the teacher and student self-efficacy indices

Domain-general teacher self-efficacy scales

The index measuring the construct of teacher self-efficacy consists of the subscales of self-efficacy in classroom management, instruction and student engagement. See Appendix B of TALIS 2013 Results: An international Perspective on Teaching and Learning (OECD, 2014b) for more details on the construction of these indices. The items belonging to each of the indices' subscales are as follows:

Efficacy in classroom management

- Control disruptive behaviour in the classroom.
- Make my expectations about student behaviour clear.
- Get students to follow classroom rules.
- Calm a student who is disruptive or noisy.

Efficacy in instruction

- Craft good questions for my students.
- Use a variety of assessment strategies.
- Provide an alternative explanation for example when students are confused.
- Implement alternative instructional strategies in my classroom.

Efficacy in student engagement

- Get students to believe they can do well in school work.
- Help my students value learning.
- Motivate students who show low interest in school work.
- Help students think critically.
- Because the overall indices did not reach scalar invariance (see Appendix B of the TALIS 2013 main report), it is not possible to directly compare scores between countries.

Domain-specific teacher self-efficacy scale: Mathematics

The index measuring the construct of teacher self-efficacy in teaching mathematics was analysed for teachers of mathematics only. See Appendix B of the TALIS 2013 main report for more details on the construction of this index. The items belonging to this scale are as follows:

- I have a hard time getting students interested in mathematics.
- I find it hard to meet the needs of individual students in my mathematics class.
- I am able to get my students to feel confident in mathematics .
- I have a hard time getting my students to understand underlying concepts in mathematics.

Because the overall indices did not reach scalar invariance (see Appendix B of TALIS 2013 Results: An International Perspective on Teaching and Learning), it is not possible to directly compare scores between countries.

Relationship between teacher self-efficacy and student Economic, Social and Cultural Status (ESCS)

This section of the paper explores the relationship between teacher self-efficacy and student Economic, Social and Cultural Status (ESCS). Family socio-economic status has been shown to be associated with student academic achievement and development (Bornstein and Bradley, 2003; Sirin, 2005). Recent reports have compared the distribution of educational opportunities through the lens of socio-economic status (OECD, 2007). It is plausible that teacher self-efficacy may vary by the overall socio-economic background of the students in their school. Perhaps teachers with higher levels of self-efficacy are purposefully distributed to lower ESCS schools – or perhaps it is a challenge to attract these teachers to these schools because of lack of incentives. The analyses reported in this section used the PISA index of ESCS which consists of parents' education, occupation and different measures of household possessions.

Of all the student factors examined in these analyses, the school's average student ESCS appears to be most often related to different aspects of teachers' self-efficacy across countries. However, the nature of the relationship differs between countries. There does not seem to be a uniform relationship between a school's overall level of student ESCS and teachers' self-efficacy (with perhaps the exception that there appears to be a positive relationship for those teachers working in schools with students from the highest ESCS level), when examining the data from all eight countries together.

One consistent is that the level of teachers' domain-specific self-efficacy (in this case mathematics teachers' self-efficacy for teaching mathematics) tends to be lower than their level of domain-general self-efficacy, see Table 22. In other words, mathematics teachers feel less confident about their ability to teach mathematics than about their ability to teach in general. TALIS does not have data on teacher self-efficacy in other subjects, so it is unclear whether this is specific to the domain of mathematics. As a result, further research into the reasons why mathematics teachers show lower levels of self-efficacy to teach mathematics compared to their more general self-efficacy is needed. For example, better teacher preparation and continuous development for pedagogy in teachers' subject fields could be a possible solution to raise subject-specific self-efficacy.

When examining the results at the country level and for the different aspects of domain-general and domain-specific self-efficacy, interesting findings emerge. When considering teachers' overall domain-general self-efficacy, a positive relationship between self-efficacy and mean students' ESCS is apparent in Latvia and Spain, while a negative relationship is apparent in Romania (see Table 21). In other words, in Latvia and Spain, teachers who work in schools with students with higher ESCS tend to report higher levels of self-efficacy than those working in schools with students with lower ESCS, while the opposite is the case in Romania. Tables 23 to 26 present the results for each component of teachers' self-efficacy. This more fine-grained analysis shows that in Latvia, the relationship is specific to teachers' feelings of self-efficacy for student instruction, while in Romania and Spain, the relationship is specific to both teachers' feelings of self-efficacy for student instruction and student engagement. Moreover, this analysis shows that in Singapore, there is a weak positive relationship between teachers' self-efficacy for student instruction and student ESCS.

These findings suggest that in at least some countries, some aspects of teachers' feelings of self-efficacy are associated with the ESCS profile of the students in their school. Further research is needed to determine where these relationships originate. It could be that some systems allow or provide for the placement of teachers with high levels of self-efficacy in schools with high (or low) ESCS. In this case, this may be an indicator that more challenging schools and communities have difficulties attracting effective teachers (Adamson & Darling-Hammond, 2011). Alternatively, this finding could indicate that student ESCS actually has an impact on teachers' beliefs in their own ability to be successful in their work. In this instance, consideration should be given to ensure that teachers working in schools with more challenging student populations receive the proper support and training to give them the confidence that they can succeed. See Box 14 for a note about the difference between how socioeconomic status of students is measured in PISA and TALIS.

Box 14. Difference between student ESCS in PISA and teacher/principal estimates of economically disadvantaged homes in TALIS

Student-level ESCS is a PISA-index variable calculated using a variety of questions that ask the student about their living conditions, parent education, culture, and quality of life. No income questions are asked of the students.

Meanwhile, both principals and teachers in TALIS were asked to estimate the percentage of students in their school or target class who are from "economically disadvantaged homes." This question may or may not be answered using hard data by the teachers and principals, therefore caution should be taken in light of possible error in estimation.

A correlation test between the teachers' response to TALIS question and the school mean ESCS value based on the PISA student responses was 0.37. This is a weak correlation indicating that the two questions capture different aspects of ESCS or that there is considerable error in the teacher estimation of percentage of students from disadvantaged homes.

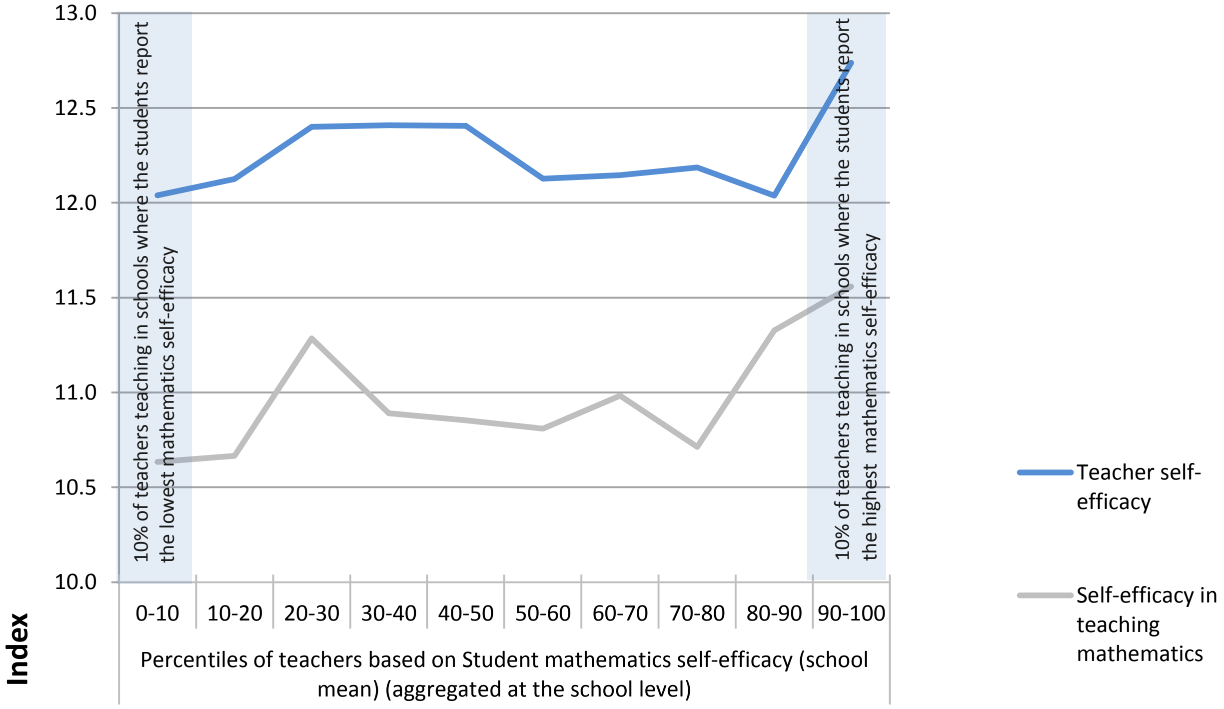
Relationship between teacher self-efficacy and student self-efficacy and mathematics achievement

This section examines the relationship between teacher self-efficacy and the average student self-efficacy in mathematics and average student achievement in their schools. The analyses used the PISA index of student self-efficacy in mathematics and the mathematics achievement as measured by the average student scores on the PISA 2012 mathematics test.

As with the previous section, when all eight countries are taken together, the relationship between teacher self-efficacy in general and the average student mathematics self-efficacy in their school is unclear. As Figure 17 indicates, there seems to be a weak tendency for a positive relationship between students' mathematics self-efficacy and the reported level of teacher self-efficacy in schools where student self-efficacy is already quite high. In other words, the figure indicates that teachers in schools where students report the highest levels of self-efficacy in mathematics, also seem to report higher levels of self-efficacy.

Figure 17. Teacher self-efficacy and student mathematics self-efficacy (school mean)

Teacher self-efficacy and self-efficacy in teaching mathematics following the percentiles of teachers based on student mathematics self-efficacy (school mean) (aggregated at the school level)

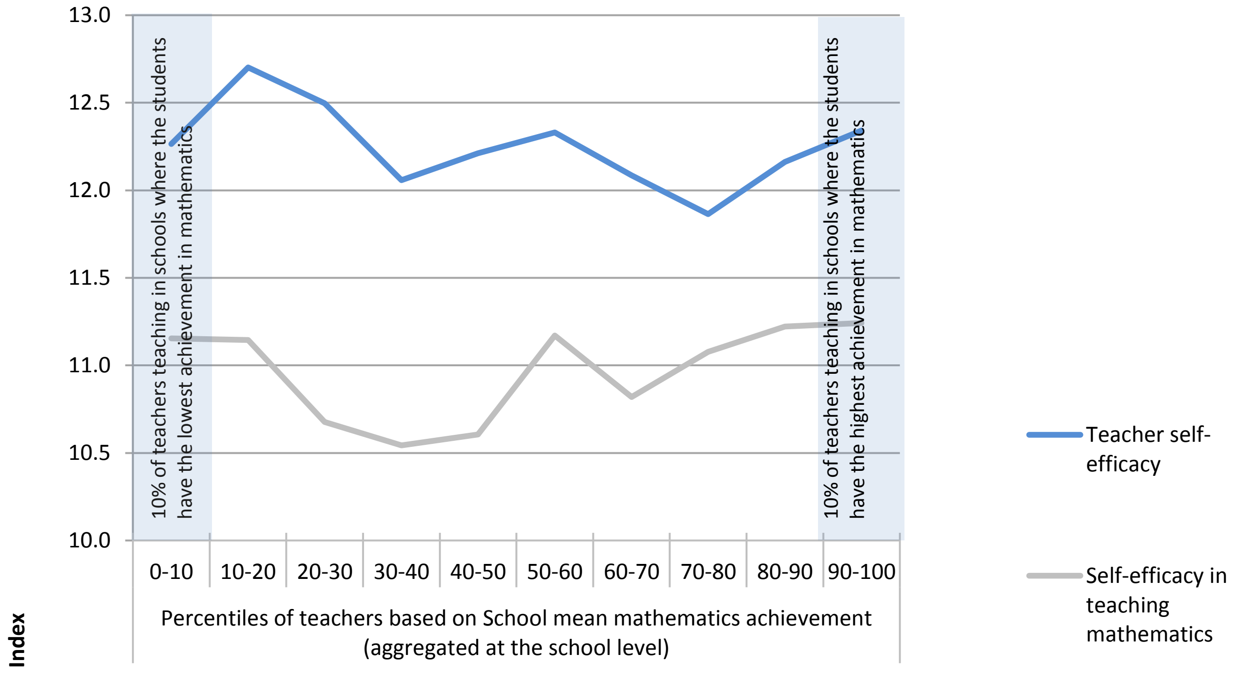


Source: OECD TALIS 2013 and PISA 2012 databases.

Figure 18 looks at teachers' self-efficacy in relation to the average students' mathematics achievement in the school, and when looking at all eight countries, there is even less of an observable pattern or trend. At the country level, a few findings emerge (see Tables 23 to 26). In Latvia, the results show that teachers who work in schools with higher levels of student performance in mathematics report lower levels of self-efficacy for instruction. This could mean that mathematics teachers in Latvia are less secure about their instructional abilities with more advanced students. In Romania, there is a positive relationship between student performance in mathematics and teachers' levels of self-efficacy for student engagement. This may indicate that Romanian teachers feel more confident engaging their higher-performing students and that the good performance of students boosts their confidence or it could be that the more confident teachers are simply distributed to schools with the highest-performing students.

Figure 18. Teacher self-efficacy and school mean mathematics achievement

Teacher self-efficacy and self-efficacy in teaching mathematics following the percentiles of teachers based on school mean mathematics achievement (aggregated at the school level)



Source: OECD TALIS 2013 and PISA 2012 databases.

In both Romania and Singapore, teachers of mathematics in schools with students who score higher on the mathematics achievement index report higher levels of self-efficacy specifically for math teaching. Again, this could be explained either by how teachers are distributed in these countries, or it could be an indication that mathematics teachers' self-efficacy in teaching mathematics is influenced by the performance of their students. Namely, mathematics teachers might feel more confident in their mathematics teaching abilities when their students perform better.

Relationship between teacher self-efficacy and student work ethic in mathematics

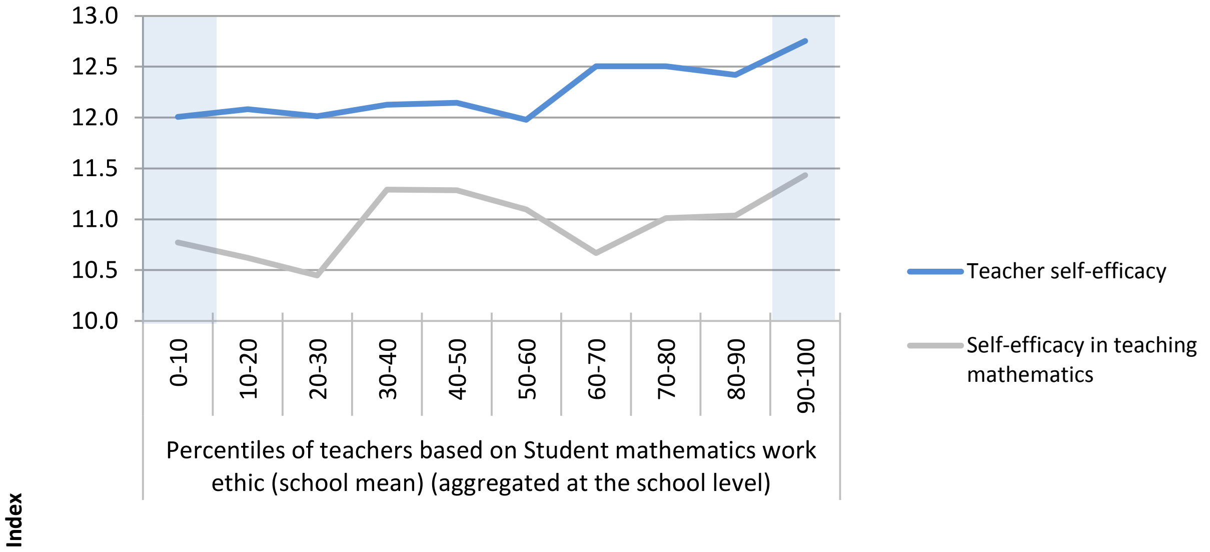
Along with talent and aptitude, work ethic as illustrated by willingness to put effort into learning and perseverance are necessary for an individual to become proficient in any endeavour. Individuals differ greatly in their capacity to continue toward a goal when they are faced with adversity, lack of progress or failure (Duckworth et al., 2007). These differences are also reflected in students' performance. For instance, some students persist and even work harder after failure, whereas others give up quickly (Diener & Dweck, 1978). Moreover, academic performance has been suggested to depend largely on students' self-discipline, more so even than students' IQ scores (Duckworth & Seligman, 2005). Thus, psychologists and educators are increasingly interested in measuring students' capacity to work toward long-term goals, including their aptitude for self-discipline and perseverance when confronted with difficulties and their ability to focus on clearly aligned goals and objectives (e.g. Greene, Miller, Crowson, Duke & Aikey, 2004; Husman & Shell, 2008; Miller & Brickman, 2004; Zimmerman & Schunk, 2011). Given the importance of these factors to students' academic success, it seems likely that students' work ethics can also be related to teachers' experiences and particularly their confidence in their abilities.

This section examines the relationships between teachers' self-efficacy and the overall work ethic in mathematics that characterises the students in their schools. PISA 2012 examined students' self-reports about their stamina, capacity for hard work and perception that success or failure depends on their behaviour (OECD, 2013b).

As shown in Figure 19, across all countries there appears to be a positive relationship between student work ethic and teacher self-efficacy (both for domain-general and domain-specific self-efficacy). As with previous results, this can be explained by specific allocation of teachers with higher levels of self-efficacy to those schools where students report stronger agreement to items on the work ethic index. It could also be an indication of teachers feeling more confident as a result of their students' hard work.

Figure 19. Teacher self-efficacy and student mathematics work ethic (school mean)

Teacher self-efficacy and self-efficacy in teaching mathematics following the percentiles of teachers based on Student mathematics work ethic (school mean) (aggregated at the school level)



Source: OECD TALIS 2013 and PISA 2012 databases.

As shown in Tables 23 to 25, in Mexico, teachers in schools with higher levels of student work ethic report higher levels of self-efficacy in each of the three areas individually (student instruction, classroom management and student engagement) as well as overall, when all of the aspects of self-efficacy are taken together. In Romania, teachers in schools where students report high levels of work ethic report higher levels of self-efficacy for classroom management. Taking into account that there may be more highly confident teachers in those Romanian schools where students report the highest work ethic, this finding could also indicate that high student work ethics demonstrate to teachers that their work is effective and this may in turn increase teacher self-efficacy. It may also be that teachers with higher self-efficacy use techniques that motivate students to have higher work ethic. As shown in Tables 23 to 26, in Mexico, teachers in schools with higher levels of student work ethic report higher levels of self-efficacy in each of the three areas individually (student instruction, classroom management and student engagement) as well as overall, when all of the aspects of self-efficacy are taken together. In Romania, teachers in schools where students report high levels of work ethic report higher levels of self-efficacy for classroom management.

Relationship between teacher self-efficacy and student sense of belonging

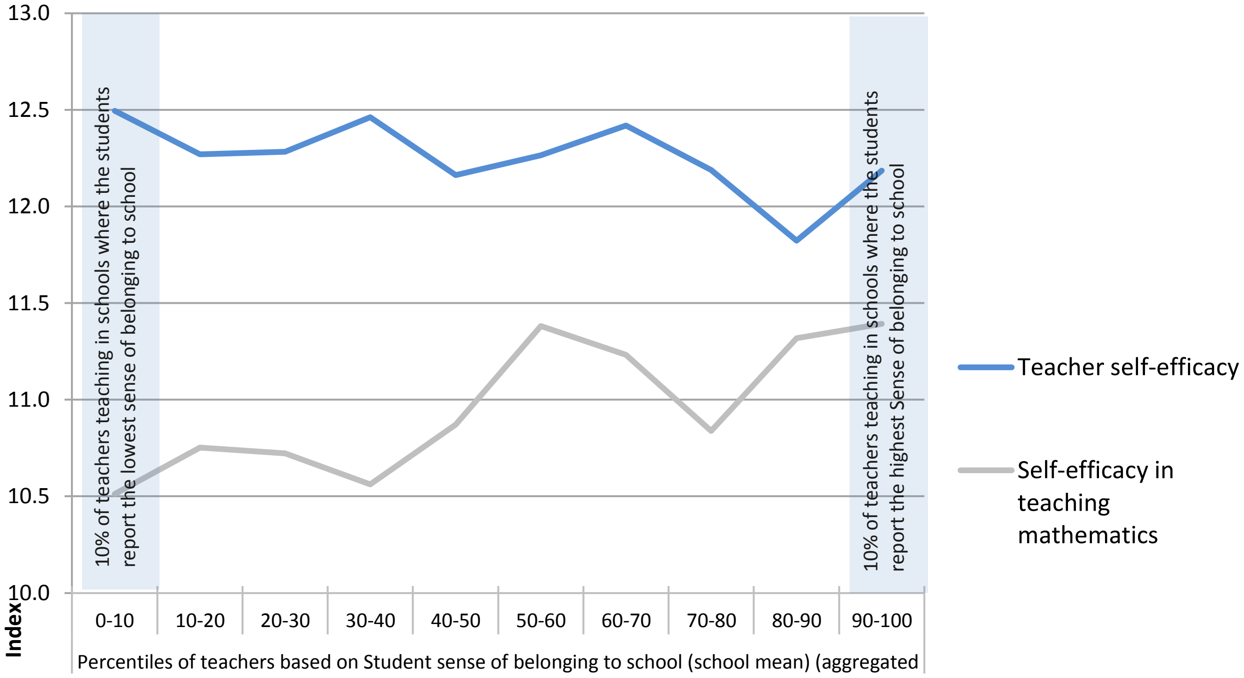
This section examines the possible relationships between teachers' self-efficacy and whether they work in a school where students report a high sense of belonging. A sense of belonging reflects how connected students feel with their school and peers. Students tend to thrive when they form positive relationships with peers, feel part of a social group and feel at ease at school. A lack of connectedness can adversely affect students' perceptions of themselves, their satisfaction with life, and their willingness to learn and to put effort into their studies (OECD, 2013). The social aspects of engagement at school are manifested in students' willingness to work with others, and their ability to function in and contribute to social institutions. When students feel a sense of belonging at school, their engagement is often enhanced (Juvonen, Espinoza and Knifsend, 2012); when they do not, behavioural problems often follow. Behavioural problems, in turn, do relate to teachers' reported levels of self-efficacy, as reported in TALIS 2013 Results: An International Perspective on Teaching and Learning. In the vast majority of the countries surveyed in TALIS 2013, teachers whose classes included more than 10% of students with behavioural problems reported lower self-efficacy levels (OECD, 2014b).

In 2012, PISA asked students to report whether they "strongly agree," "agree," "disagree," or "strongly disagree" that they feel like an outsider or left out of things, that they make friends easily, that they feel like they belong, that they feel awkward and out of place, that other students seem to like them, or that they feel lonely. The findings in this section discuss students' sense of belonging and its relationships with teachers' reported levels of self-efficacy.

Working in schools where students report a high or low sense of belonging does not appear to be strongly related to teachers' feelings of self-efficacy when examining the data from all eight countries together. As shown in Figure 20, the relationship between the school profile in terms of students' sense of belonging, and teachers' reported domain-general self-efficacy appears to show a slight tendency for a negative relationship, though the opposite is observed with mathematics teachers' domain-specific self-efficacy. However, when examining the findings at the country level, significant findings emerge in Portugal and Spain.

Figure 20. Teacher self-efficacy and student sense of belonging to school (school mean)

Teacher self-efficacy and self-efficacy in teaching mathematics following the percentiles of teachers based on student sense of belonging to school (school mean) (aggregated at the school level)



Source: OECD TALIS 2013 and PISA 2012 databases.

Specifically, when considering teachers' overall domain-general self-efficacy, a positive relationship is apparent in both Portugal and Spain. Namely, Spanish and Portuguese teachers who work in schools with students who report a higher sense of belonging tend to report higher levels of self-efficacy than those working in schools with students with a lower sense of belonging.

Tables 23 to 26 present the results for each components of teachers' self-efficacy. This more fine-grained analysis also shows that in Portugal and Spain, this relationship holds across all components of teacher domain-general self-efficacy. In other words, not only do teachers working in schools with students who report a high sense of belonging have higher overall levels of self-efficacy, but they also report higher levels of self-efficacy for student engagement, student instruction and classroom management more specifically. Furthermore, in Spain, mathematics teachers who work in these schools also show higher levels of domain-specific self-efficacy in teaching mathematics.

These findings suggest that students' sense of belonging and teachers' beliefs in their own professional abilities can influence each other. The causal direction of this relationship, when present, cannot be ascertained with these data, but these findings are one further indication that student characteristics should be considered when investigating which school factors may be associated with teachers' feelings of self-efficacy.

Relationship between teacher self-efficacy and student attitudes toward school and learning

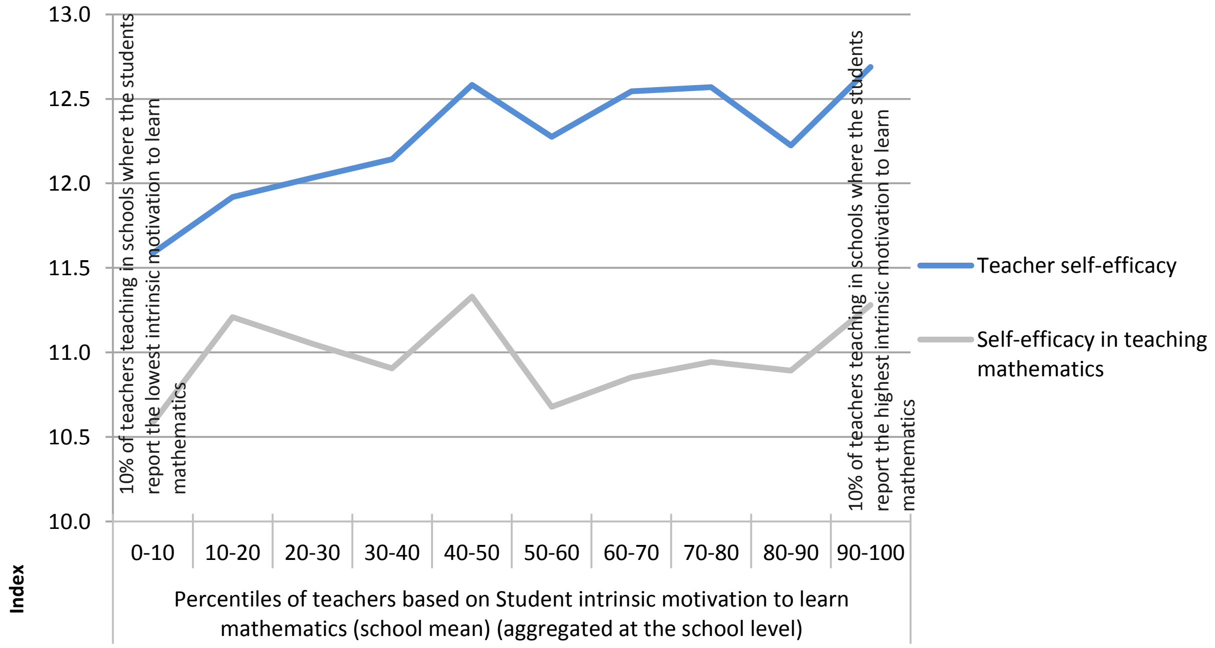
This section of the paper explores the relationship between teacher self-efficacy and student attitudes toward learning and towards school. Motivation and engagement can be regarded as the driving forces behind learning. PISA distinguishes two forms of motivation to learn mathematics: students may learn mathematics because they enjoy it and find it interesting (so called intrinsic motivation) and/or because they perceive learning mathematics as useful (so called extrinsic motivation) (OECD, 2013b). This section focuses on intrinsic motivation, which more specifically refers to the drive to perform an activity purely for the joy gained from the activity itself. Students' motivation to learn mathematics can be called intrinsic when it originates from a place of personal interest, enjoyment and pleasure. Interest and enjoyment affect both the degree and continuity of engagement in learning and the depth of understanding reached (Schiefele, 2009). Intrinsic motivation affects the degree of student engagement, the choice of learning activities in which students enrol, student performance and the types of careers students aspire to and choose to pursue (Reeve, 2012). This section explores the extent to which teachers' self-efficacy is related to whether students in their school show an interest and a motivation to learn.

Further, it is reasonable to assume that students' attitudes towards school in general are an important aspect of the school climate which also might be related to teachers' feelings of self-efficacy. PISA 2012 asked students about their motivation to learn mathematics and about whether trying hard at school was important and whether it could achieve various results, such as helping them get a good job or get into a good university.

Figure 21 shows, the overall relationship, for all eight countries combined, between teachers' domain-general and domain-specific self-efficacy, and a school's students' intrinsic motivation to learn mathematics. The figure shows a general trend towards a positive relationship for overall self-efficacy suggesting that overall, teachers who work in schools where students show higher levels of intrinsic motivation to learn math also tend to report higher levels of self-efficacy. But this trend is not significant in any of the countries when examined separately, nor is it apparent for many of the components of self-efficacy in the eight countries examined (see Table 22).

Figure 21. Teacher self-efficacy and student intrinsic motivation to learn mathematics (school mean)

Teacher self-efficacy and self-efficacy in teaching mathematics following the percentiles of teachers based on Student intrinsic motivation to learn mathematics (school mean) (aggregated at the school level)



Source: OECD TALIS 2013 and PISA 2012 databases.

As shown in Table 24, only in Romania is there a significant positive relationship between a school's level of student intrinsic motivation to learn mathematics and one of the component of teachers' level of self-efficacy (in this case, self-efficacy for instruction). In other words, Romanian teachers who work in schools where students show higher levels of intrinsic motivation for learning also tend to show higher levels of self-efficacy for student instruction.

In Australia, there is a significant positive relationship between students' attitude toward school and mathematics teachers' self-efficacy in mathematics (see Table 25). Australian mathematics teachers who work in schools where students show more positive attitudes toward the importance of school also tend to show higher levels of self-efficacy for teaching mathematics.

Multilevel model of country profiles

Multilevel models were developed to further examine relationships between teacher general-domain self-efficacy from TALIS and student factors from PISA. Teacher-level background variables in these analyses included gender, years of experience, whether or not they are a mathematics teacher, and the number of professional development topics about which they received training in the last year.

Two student factors were selected as predictor variables for the model. The first is the PISA measure of Economic, Social and Cultural Status (ESCS).The second is the PISA mathematics achievement score which is a test score of mathematics skills (OECD, 2012). Both of the student outcomes were mean-aggregated to the school level before merging onto the teacher dataset for analysis. Additionally, the within school standard-deviations of ESCS and PISA mathematics achievement were included as school level predictors to examine whether high or low school variability in these factors are related to teachers' self-efficacy.

The model examined both the effect that each of the variables individually may have on teacher self-efficacy (i.e. main effects), but also examined whether teacher gender and teacher subject (mathematics vs. non-mathematics) interacted with the mean and variability of mathematics achievement in the school (i.e. cross-level interactions) to influence teacher self-efficacy.

Table 26 contains the results for the multilevel model. All countries except for Finland exhibited at least one significant interaction between teacher and student measures. Finland lacks significant interactions possibly due to the more homogeneous nature of its relatively small population. However, the variability in student achievement in the school was significantly related to teacher self-efficacy in Finland, namely teachers working in schools where there is greater variability in student mathematics achievement tend to show higher levels of self-efficacy.

These results can also be explained using the literature on ability grouping. Although research on ability grouping is very controversial, there is some evidence indicating that learning is enhanced when students of varying ability levels are grouped rather than when students are put in the same group or class based on their academic ability (Gamoran, 2010; Oakes, 2005). When students of varying ability perform well and achievement gaps are minimised, it could follow that teachers' efficacy would be enhanced. Increasingly, teachers are offered support on how to deploy differentiated instruction, collaborative learning and other forms of pedagogical practices for facilitating effective instruction within diverse groups of students. It is possible that teachers may feel more efficacious when they see the effects of their instructional practices, especially in classrooms and schools with students of varying ability levels.

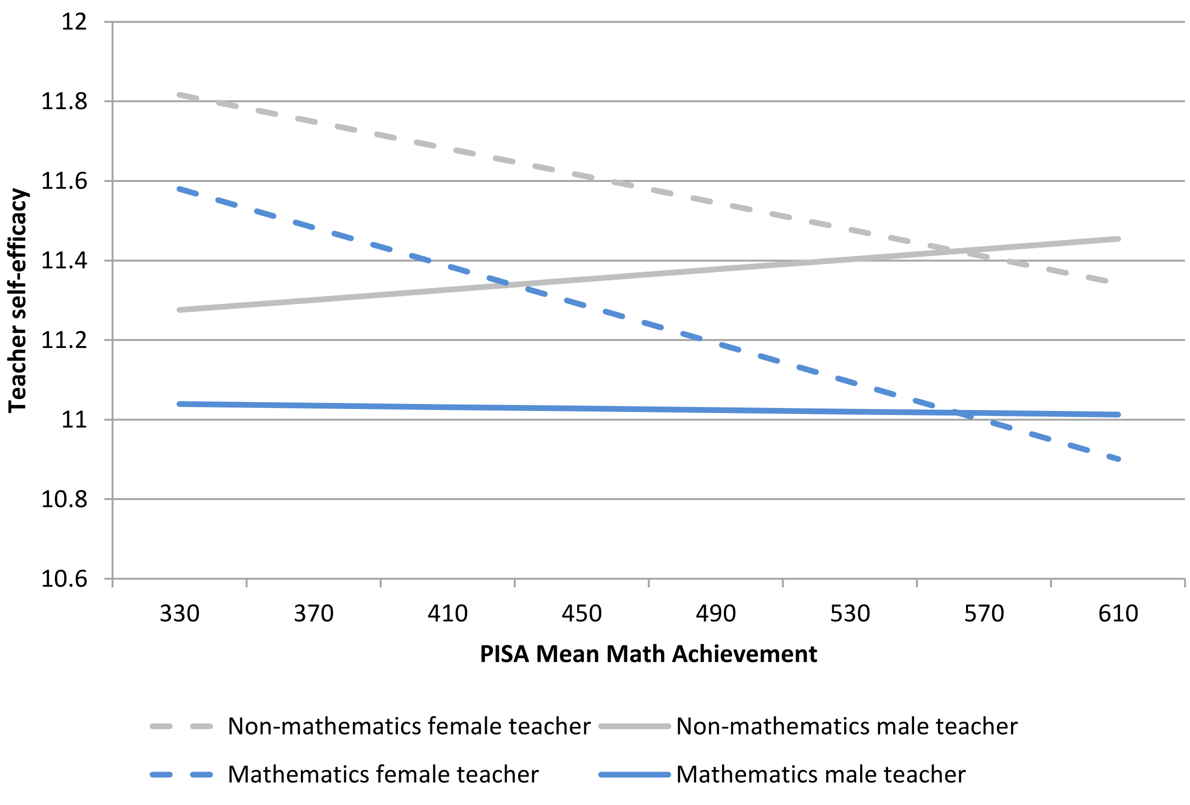
The significant negative interaction between gender and mathematics achievement in Spain, indicates a decrease, in self-efficacy for female teachers compared to male teachers as the average students' mathematics achievement in the school increases. In countries such as Australia, Mexico, Portugal and

Romania, where these effects are positive, this tendency is reversed, thus there is a greater increase in self-efficacy for female teachers as students' mathematics scores increase in the school.

Figure 22 shows an example of the relationship between the average student mathematics achievement in the school and teachers' general-domain self-efficacy by gender, for both mathematics and all teachers in Spain. The figure shows that self-efficacy is higher, in general, for teachers of all subjects combined compared with mathematics teachers. However, female teachers in Spain who teach in schools with higher average mathematics achievement tend to exhibit lower levels of self-efficacy, compared to their counterparts. One should keep in mind, however, that the overall change in self-efficacy as mathematics achievement changes from its minimum to maximum, is less than a standard deviation on the teacher self-efficacy scale.

Figure 22. Gender - PISA mathematics achievement interaction

Gender - PISA mathematics achievement interaction predicting general-domain teacher self-efficacy by mathematics and all teachers in Spain



Source: OECD, TALIS 2013 and PISA 2012 databases.

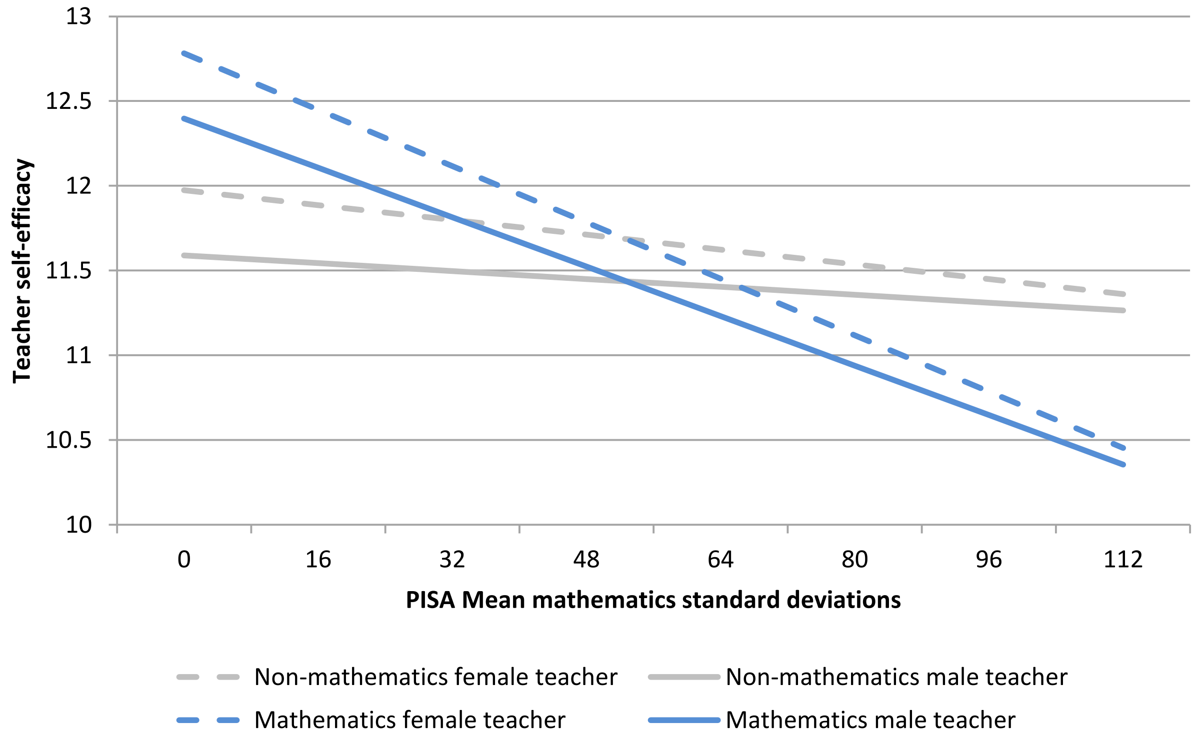
Australia, Mexico, and Romania also exhibited significant interactions between gender, teachers' subject and average school mathematics achievement, although the direction of the effects varied for mathematics and all teachers in some countries. These three countries exhibited a similar relationship where all teachers generally exhibited higher levels of self-efficacy compared to mathematics teachers across a significant range of mathematics achievement in the school. Australia was the only country that exhibited a consistent positive relationship between self-efficacy and mathematics achievements for all teachers. That is, Australian teachers report higher levels of self-efficacy in schools with higher mathematics achievement compared to teachers in schools with lower mathematics achievement. Both

Mexico and Romania exhibited negative relationships between self-efficacy and mathematics achievement for at least some of their teachers.

Figure 23 provides an illustration for the interactions between gender and variability in school achievement in Spain, while holding the average school achievement constant for mathematics and all teachers. The figure shows that, in general, female teachers in Spain tend to have higher levels of self-efficacy compared to their male counterparts. The figure also illustrates the importance of understanding how variability in the classroom impacts teachers. Figure 26 shows that teachers of all subjects combined in Spain appear to be less affected by variability in mathematics achievement among students in their school compared with mathematics teachers. As variability increases, the self-efficacy levels of mathematics teachers decrease while the self-efficacy of all teachers remains almost unchanged. Mathematics teachers, however, report higher levels of self-efficacy in schools with lower mathematics achievement variability among students. This may be an indication that as variability among students increases, teachers have more difficulty effectively reaching as many students. This finding is opposite to the finding for Finland outlined before.

Figure 23. Gender - PISA mathematics variability interaction

Gender - PISA mathematics variability interaction predicting general-domain teacher self-efficacy by mathematics and all teachers in Spain



Source: OECD, TALIS 2013 and PISA 2012 databases.

SECTION 7: SUMMARY AND IMPLICATIONS

Interactions between teacher characteristics and student measures, such as Economic, Social and Cultural Status (ESCS) and math achievement, indicate that predictive relationships are complex, intertwined, and often unique to individual countries. Many of the multilevel models revealed significant interactions involving student measures with teacher gender or subject taught (mathematics or all subjects combined), and years of experience. Significant interactions were prevalent between these teacher characteristics and diverse student measures such as ESCS, mathematics achievement, sense of belonging, mathematics self-efficacy, mathematics anxiety, student attitudes toward school, student-teacher relations, and student family immigration status. Given that the interplay between these characteristics can be vastly different in different countries across the world, it is very difficult to fit a single explanatory model to describe all possible relationships. In this paper, we attempted to address this issue in two ways. First, we selected predictor variables that were appropriate for the outcomes being modelled based on prior research and second, we limited the possible interaction terms to basic teacher characteristics such as gender, years of experience, and the mathematics teacher indicator.

The models employed in this paper have shown that measures of variability add a comparable amount of explanatory power compared to averaged index scales. Furthermore, our multilevel models have revealed that in some cases where index scales are non-significant, explanatory relationships may still be evident when examining the variability of those same measures and how teachers respond to the variability of their students. For example in Australia, Latvia, and Romania the interaction between the index scale ESCS and teacher gender is not significant, yet the interaction with ESCS variability and gender is highly significant indicating that ESCS variability adds meaningful explanatory power to teacher outcomes, above and beyond the ESCS index scale. Furthermore, in Finland, Mexico, Portugal, Singapore, and Spain both interaction terms for ESCS and gender are significant. These results suggest that the use of country-specific models, particularly models that incorporate measures of variability in addition to standard index scales, need to be further explored.

The implications for policy makers, stakeholders, school administrators, teachers, and other researchers is that the variability of student characteristics is an important consideration that complements the information provided by standard index scales. Understanding that variability within student classrooms is as important as mean comparisons can be a good basis for providing resources, professional development, and other support to teachers, based on the variation of student characteristics in a class or school.

Professional development

The main-effects-only models indicated that the average Economic, Social and Cultural Status (ESCS) of the students in a school is most frequently found to be related to teachers' reported engagement in effective forms of professional development, although the direction of this relationship differs between countries. For example, teachers in schools with higher average ESCS in Finland and Romania are more likely to say that their professional development had effective characteristics. Conversely, teachers in schools with higher average ESCS in Portugal are less likely to say that their professional development had effective characteristics. Regarding mathematics teachers' reports of engagement in effective professional development, they seem to be most significantly related to student truancy factors across participating countries (for Australia, Mexico and Portugal). In most cases, mathematics teachers who work in schools with higher levels of truancy tend to report less engagement in effective forms of professional development.

Multilevel models with interactions consistently indicated significant relationships predicting teacher outcomes involving needs for and reports of effective professional development. Significant predictive interactions for teachers included teacher gender interacting with student measures for truancy, ESCS, mathematics achievement, attitudes toward school, mathematics anxiety, and mathematics self-efficacy. Significant relationships often changed directions, however. For example, in the model for effective professional development, significant interactions for student attitudes and teacher gender revealed that male and female teachers had opposite responses to student attitudes in Latvia, Mexico and Portugal_but consistently positive responses in Australia and Romania[4] indicating that male and female teachers respond to student attitudes differently in Latvia, Mexico and Portugal than in Australia and Romania.

Teaching practices & beliefs

Teachers with high levels of constructivist beliefs reported greater frequency of use of the eight teaching practices assessed compared to teachers with low constructivist beliefs. There is some variation in the frequency of use of each practice.

Across the majority of countries, most mathematics teachers have some common practices. They tend to place students in groups for work and give students quizzes, but they do not regularly assign students projects that take more than a class period to complete. While about two-thirds of mathematics teachers indicated that they made use of projects that require more than a week to complete at least occasionally, nearly 90% of teachers of all subjects combined responded that they made use of this practice occasionally or more frequently. This strong disparity between mathematics teachers and all teachers on the use of this practice, among other practices, does not match the distribution of constructivist beliefs among teachers. Mathematics teachers on average reported slightly higher constructivist beliefs than all teachers. The differences in practice regardless of teaching beliefs could be an interesting finding for further research. Would research into increasing the use of active teaching practices among mathematics teachers help students with mathematics anxiety issues?

Another area in which beliefs and practices are especially interesting concerns the finding that teachers of all subjects combined are one and a half times more likely to use Information and Communication Technology (ICT) in their teaching than mathematics teachers. The use of internet resources appeared, however, to be the only type of ICT that is used frequently by a near majority of teachers in some countries (e.g. Australia, Latvia, Mexico and Portugal). These results indicate that there is still an untapped potential in most countries in terms of teachers' application of ICT tools to improve teaching and learning. This potential seems to apply to mathematics teachers as much as to teachers for all subjects, although future research in this area should probably consider differences in how mathematics teachers and all teachers might make use of ICT.

Self-Efficacy

One of the most consistent findings about self-efficacy was the tendency across countries for mathematics teachers' general-domain self-efficacy to be lower than that of all teachers. Additionally, mathematics teachers' level of self-efficacy for teaching mathematics also tended to be lower than that of all teachers' general-domain self-efficacy. Moreover, many countries displayed differences in self-efficacy for female teachers compared to male teachers. For instance, significant differences were observed in Spain between male and female teachers' self-efficacy in schools with varying levels of mathematics achievement scores and variability. Further research into the reasons why mathematics teachers consistently report lower levels of self-efficacy to teach mathematics compared to more general self-

[4] Please note that interactions are an additive combination of the coefficients for both the interaction term as well as the main effects regardless of whether the main effects test as significant.

efficacy is needed as well as how mathematics achievement affects male and female teachers differently. Perhaps better teacher preparation and continuous development for pedagogy in teachers' subject fields may help improve mathematics teachers' self-efficacy in teaching mathematics.

Results for the relationship between teacher self-efficacy and Economic, Social and Cultural Status (ESCS) also suggest many additional areas for future research. In some countries, teachers working in schools with students from the highest ESCS level also report high self-efficacy. Is this because teachers in high ESCS schools have better resources to bring to their teaching environments? A school's average student ESCS appears to be most often related to different aspects of teachers' self-efficacy across countries. However, the nature of the relationship differs between countries. For instance, there does not seem to be a uniform relationship between a school's overall level of student ESCS and teachers' self-efficacy when examining the data from all eight countries together. There does, however, seem to be a trend toward greater self-efficacy in higher ESCS schools, especially for teaching mathematics.

Results also seem to support further study of self-efficacy in relation to measures of variability, especially mathematics achievement and ESCS variability. In six countries (Australia, Finland, Latvia, Mexico, Romania, and Singapore) teachers who are in schools with greater variability in PISA mathematics achievement scores tend to have higher levels of domain-general self-efficacy. Similarly, mathematics teachers report higher levels of self-efficacy in schools with higher mathematics achievement variability among students. This may be an indication that, as variability among students increases, teachers may feel that they are better able to reach students whom they can help. Teachers in classes with little variability may feel especially frustrated in such environments if average math achievement is particularly low. Additionally, teachers in low-variability environments where student mathematics achievement is high may still be frustrated if they feel that their students are achieving less than they should. Teachers in high-variability classrooms may benefit from students who model success for lower achieving students. Additionally, teachers have a greater means of comparing their teaching strategies in classrooms with high variability leading to opportunities for increased teaching self-efficacy.

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ANNEX: TABLES

Table 1. Gender and age distribution of teachers

All TALIS - PISA link teachers

	Female		Percentage of teachers in each age group												Average age	
			Under 25 years		25-29 years		30-39 years		40-49 years		50-59 years		60 years or more			
	%	(S.E.)	%	(S.E.)	%	(S.E.)	%	(S.E.)	%	(S.E.)	%	(S.E.)	%	(S.E.)	Average	(S.E.)
Australia	58.6	(1.3)	3.6	(0.4)	13.9	(1.0)	26.1	(1.1)	25.5	(0.9)	24.1	(1.0)	6.7	(0.5)	42.1	(0.3)
Finland	70.0	(0.7)	0.6	(0.2)	7.4	(0.7)	27.2	(1.0)	32.0	(0.8)	27.1	(1.0)	5.8	(0.5)	44.3	(0.3)
Latvia	87.7	(0.5)	1.6	(0.4)	4.3	(0.7)	14.8	(1.1)	34.6	(1.7)	35.2	(1.6)	9.5	(0.8)	47.3	(0.4)
Mexico	49.2	(2.5)	2.3	(0.6)	10.6	(1.1)	31.8	(2.3)	33.6	(3.0)	17.7	(1.7)	4.0	(0.7)	41.5	(0.6)
Portugal	70.8	(0.8)	0.2	(0.1)	1.1	(0.4)	20.5	(1.1)	45.5	(1.0)	29.3	(1.2)	3.4	(0.4)	45.6	(0.3)
Romania	68.9	(1.2)	1.6	(0.6)	5.7	(0.7)	35.8	(2.3)	24.0	(1.2)	25.1	(2.0)	7.8	(0.8)	43.5	(0.5)
Singapore	64.4	(0.8)	3.5	(0.3)	22.7	(0.8)	39.6	(0.8)	21.2	(0.6)	10.5	(0.5)	2.5	(0.3)	37.0	(0.2)
Spain	59.9	(0.9)	0.1	(0.0)	2.2	(0.3)	24.8	(1.1)	38.6	(1.0)	30.6	(1.5)	3.7	(0.4)	45.5	(0.3)
Average	66.2	(0.4)	1.7	(0.1)	8.5	(0.3)	27.6	(0.5)	31.9	(0.5)	25.0	(0.5)	5.4	(0.2)	43.4	(0.1)

Source: OECD, TALIS 2013 and PISA 2012 databases.

Only mathematics TALIS - PISA link teachers

	Female		Percentage of teachers in each age group												Average age	
			Under 25 years		25-29 years		30-39 years		40-49 years		50-59 years		60 years or more			
	%	(S.E.)	%	(S.E.)	%	(S.E.)	%	(S.E.)	%	(S.E.)	%	(S.E.)	%	(S.E.)	Average	(S.E.)
Australia	49.5	(1.9)	3.2	(0.7)	11.7	(1.3)	20.5	(1.7)	28.8	(2.1)	27.8	(1.9)	8.0	(1.2)	44.0	(0.5)
Finland	60.5	(2.1)	0.4	(0.2)	9.6	(1.0)	29.1	(1.9)	28.2	(1.9)	26.9	(1.9)	5.9	(0.8)	43.6	(0.4)
Latvia	95.9	(1.7)	1.5	(0.7)	2.5	(0.9)	12.4	(2.3)	24.0	(3.2)	50.6	(4.1)	9.0	(2.0)	49.0	(0.7)
Mexico	35.2	(4.2)	2.5	(1.2)	4.2	(1.7)	38.9	(6.5)	31.1	(4.2)	20.5	(3.8)	2.8	(1.1)	42.1	(1.0)
Portugal	73.8	(2.5)	0.0	(0.0)	0.1	(0.1)	28.0	(2.4)	43.3	(2.7)	25.6	(3.3)	3.0	(0.8)	44.7	(0.5)
Romania	66.3	(3.5)	2.5	(2.2)	1.6	(0.5)	25.9	(4.4)	30.1	(3.3)	24.0	(3.1)	15.9	(3.4)	46.7	(1.2)
Singapore	56.3	(1.7)	2.2	(0.6)	16.4	(1.4)	46.5	(1.8)	23.4	(1.5)	9.0	(0.9)	2.4	(0.5)	37.3	(0.3)
Spain	53.6	(1.8)	0.0	(0.0)	1.7	(0.5)	28.0	(2.3)	36.7	(2.7)	30.0	(2.3)	3.6	(0.6)	45.4	(0.4)
Average	61.4	(0.9)	1.5	(0.3)	6.0	(0.4)	28.7	(1.2)	30.7	(1.0)	26.8	(1.0)	6.3	(0.6)	44.1	(0.2)

Source: OECD, TALIS 2013 and PISA 2012 databases.

Table 2. Teachers' educational attainment

All TALIS - PISA link teachers

	Highest level of formal education completed							
	Below ISCED Level 5		ISCED Level 5B[2]		ISCED Level 5A		ISCED Level 6	
	%	(S.E.)	%	(S.E.)	%	(S.E.)	%	(S.E.)
Australia	0.1	(0.0)	0.2	(0.1)	98.5	(0.3)	1.2	(0.3)
Finland	0.7	(0.2)	3.2	(0.3)	94.7	(0.5)	1.4	(0.3)
Latvia	2.0	(0.4)	1.5	(0.5)	96.2	(0.7)	0.3	(0.1)
Mexico	5.2	(0.8)	1.0	(0.3)	92.1	(1.0)	1.7	(0.5)
Portugal[3]	0.2	(0.1)	2.5	(0.3)	84.3	(0.8)	13.0	(0.8)
Romania	1.9	(0.5)	3.1	(0.8)	91.4	(0.8)	3.6	(0.5)
Singapore	0.9	(0.2)	3.2	(0.3)	95.6	(0.3)	0.4	(0.1)
Spain	4.2	(0.3)	0.7	(0.1)	90.3	(0.5)	4.8	(0.3)
Average	1.9	(0.1)	1.9	(0.1)	92.9	(0.2)	3.3	(0.1)

Source: OECD, TALIS 2013 and PISA 2012 databases.

Only mathematics TALIS - PISA link teachers

	Highest level of formal education completed							
	Below ISCED Level 5		ISCED Level 5B[2]		ISCED Level 5A		ISCED Level 6	
	%	(S.E.)	%	(S.E.)	%	(S.E.)	%	(S.E.)
Australia	0.1	(0.1)	0.1	(0.1)	98.9	(0.3)	1.0	(0.3)
Finland	1.8	(0.8)	1.6	(0.4)	95.3	(0.7)	1.4	(0.4)
Latvia	0.5	(0.4)	0.4	(0.3)	98.9	(0.5)	0.2	(0.1)
Mexico	2.3	(2.2)	0.1	(0.1)	96.8	(2.3)	0.8	(0.5)
Portugal[3]	0.3	(0.2)	1.8	(0.8)	85.8	(2.0)	12.1	(1.7)
Romania	0.1	(0.1)	8.4	(4.1)	90.3	(4.2)	1.2	(0.5)
Singapore	1.0	(0.5)	0.3	(0.2)	98.5	(0.5)	0.2	(0.1)
Spain	4.1	(0.8)	0.3	(0.2)	94.1	(0.9)	1.6	(0.4)
Average	1.3	(0.3)	1.6	(0.5)	94.8	(0.7)	2.3	(0.2)

1. Education categories are based on the International Standard Classification of Education (ISCED 1997). ISCED level 5A programmes are generally longer and more theory-based, while 5B programmes are typically shorter and more practical and skills oriented. No distinction was made between ISCED level 5A (Bachelor) and ISCED level 5A (Master).

2. Includes Bachelor's degrees in some countries.

3. In Portugal, the teachers with a "Pre-Bologna Master's degree" are counted as ISCED level 6. The way the question is presented prevents the disaggregation between "Pre-Bologna Master's degree" and "Doctorate degree".

Source: OECD, TALIS 2013 and PISA 2012 databases.

Table 3. Completion and content of teacher education or training programme, all teachers

All TALIS - PISA link teachers

	Completed a teacher education or training programme		Elements included in formal education and training											
			Content of the subject(s) being taught				Pedagogy of the subject(s) being taught				Practice in the subject(s) being taught			
			For all subjects being taught		For some subjects being taught		For all subjects being taught		For some subjects being taught		For all subjects being taught		For some subjects being taught	
	%	(S.E.)	%	(S.E.)	%	(S.E.)	%	(S.E.)	%	(S.E.)	%	(S.E.)	%	(S.E.)
Australia	97.8	(0.3)	65.4	(1.1)	29.7	(1.1)	67.6	(1.0)	28.8	(1.0)	73.1	(1.0)	24.1	(0.9)
Finland	92.2	(0.5)	75.6	(0.8)	20.9	(0.8)	72.5	(1.0)	23.2	(0.8)	68.1	(0.8)	26.4	(0.7)
Latvia	89.8	(0.9)	86.0	(1.0)	10.6	(0.9)	85.6	(1.2)	10.6	(1.0)	80.3	(1.4)	12.3	(1.0)
Mexico	41.9	(4.5)	62.4	(2.7)	26.6	(3.0)	54.3	(2.3)	33.5	(2.8)	47.7	(2.2)	29.5	(1.7)
Portugal	83.8	(0.7)	73.6	(1.3)	24.3	(1.3)	71.8	(1.1)	23.7	(1.0)	67.9	(1.3)	22.1	(1.1)
Romania	98.5	(0.2)	83.7	(0.8)	12.4	(0.8)	81.4	(1.1)	14.5	(1.0)	78.3	(1.0)	15.0	(0.8)
Singapore	99.2	(0.1)	80.3	(0.6)	16.5	(0.6)	84.8	(0.7)	13.7	(0.6)	86.0	(0.6)	12.3	(0.6)
Spain	97.7	(0.3)	66.8	(0.9)	27.9	(0.8)	47.0	(1.1)	29.4	(0.9)	45.4	(0.9)	30.1	(0.8)
Average	87.6	(0.6)	74.2	(0.5)	21.1	(0.5)	70.6	(0.4)	22.2	(0.5)	68.4	(0.4)	21.5	(0.4)

Source: OECD, TALIS 2013 and PISA 2012 databases.

Table 4. Completion and content of teacher education or training programme, mathematics teachers

Only mathematics TALIS - PISA link teachers

	Completed a teacher education or training programme		Mathematics courses equivalent to those needed for a degree in mathematics								Courses on how to teach mathematics								Practice of teaching mathematics							
			Before		After		Both before and after		Never		Before		After		Both before and after		Never		Before		After		Both before and after		Never	
	%	(S.E.)	%	(S.E.)	%	(S.E.)	%	(S.E.)	%	(S.E.)	%	(S.E.)	%	(S.E.)	%	(S.E.)	%	(S.E.)	%	(S.E.)	%	(S.E.)	%	(S.E.)	%	(S.E.)
Australia	97.3	(0.7)	60.3	(2.6)	6.3	(1.1)	14.8	(1.7)	18.6	(2.0)	47.6	(2.7)	12.4	(1.7)	27.6	(2.4)	12.3	(1.1)	50.8	(2.7)	12.8	(1.5)	27.6	(2.3)	8.7	(1.1)
Finland	91.2	(1.1)	65.7	(2.6)	1.7	(0.5)	11.7	(1.6)	20.9	(2.2)	68.6	(1.8)	6.7	(1.0)	11.9	(1.3)	12.8	(1.6)	71.1	(1.9)	7.3	(1.1)	7.9	(1.1)	13.7	(1.5)
Latvia	94.7	(1.4)	18.7	(4.5)	29.3	(2.7)	23.3	(4.5)	28.8	(4.5)	6.5	(1.4)	65.3	(4.4)	26.4	(4.4)	1.8	(0.7)	50.2	(5.0)	16.4	(4.1)	31.2	(3.4)	2.3	(0.8)
Mexico	38.7	(7.4)	48.1	(4.3)	15.2	(3.6)	25.3	(4.6)	11.5	(2.4)	20.7	(5.0)	33.4	(3.9)	30.9	(5.2)	15.0	(3.6)	27.8	(5.2)	29.6	(4.2)	33.7	(4.9)	8.9	(2.4)
Portugal	80.3	(2.5)	68.5	(3.5)	8.7	(3.5)	16.8	(2.1)	6.1	(1.4)	20.3	(2.0)	27.6	(3.1)	35.2	(2.8)	16.9	(2.2)	15.4	(2.1)	33.4	(2.8)	44.7	(2.6)	6.5	(1.8)
Romania	98.5	(0.6)	65.3	(7.3)	4.0	(1.0)	14.1	(2.8)	16.6	(5.5)	54.9	(7.0)	6.1	(1.3)	31.0	(4.2)	8.0	(5.1)	74.1	(3.2)	3.5	(0.8)	19.5	(2.8)	2.9	(1.0)
Singapore	99.3	(0.3)	41.5	(1.8)	9.4	(1.0)	33.8	(1.5)	15.3	(1.4)	22.6	(1.4)	30.8	(1.3)	44.6	(1.6)	2.0	(0.6)	25.7	(1.4)	30.7	(1.5)	41.6	(1.5)	2.1	(0.5)
Spain	97.0	(0.7)	50.0	(2.2)	5.3	(0.7)	15.6	(1.4)	29.2	(1.9)	19.2	(1.8)	34.8	(2.2)	25.4	(2.1)	20.5	(1.8)	30.2	(1.7)	29.0	(2.2)	17.9	(1.6)	22.9	(1.8)
Average	87.1	(1.0)	52.2	(1.4)	10.0	(0.8)	19.4	(1.0)	18.4	(1.1)	32.6	(1.2)	27.2	(0.9)	29.1	(1.2)	11.1	(0.9)	43.2	(1.1)	20.3	(0.9)	28.0	(1.0)	8.5	(0.5)

Source: OECD, TALIS 2013 and PISA 2012 databases.

Table 5. Average years of working experience

All TALIS - PISA link teachers

	Average years of working experience as a teacher at this school		Average years of working experience as a teacher in total		Average years of working experience in other education roles		Average years of working experience in other jobs		Percentage of teachers with more than 5 years of experience as a teacher in total	
	Average	(S.E.)	Average	(S.E.)	Average	(S.E.)	Average	(S.E.)	%	(S.E.)
Australia	7.9	(0.2)	15.3	(0.3)	1.7	(0.1)	5.7	(0.2)	76.9	(1.1)
Finland	10.4	(0.2)	15.2	(0.3)	1.3	(0.1)	3.5	(0.1)	80.0	(1.2)
Latvia	15.8	(0.5)	22.2	(0.4)	3.1	(0.2)	3.5	(0.3)	92.6	(1.0)
Mexico	10.5	(0.6)	14.4	(0.8)	3.5	(0.5)	8.3	(0.7)	79.3	(2.1)
Portugal	11.2	(0.3)	20.5	(0.3)	3.7	(0.2)	1.9	(0.2)	97.2	(0.6)
Romania	11.5	(0.4)	17.9	(0.5)	4.8	(0.3)	3.1	(0.1)	88.1	(1.2)
Singapore	6.5	(0.1)	10.8	(0.2)	1.3	(0.1)	1.6	(0.1)	64.4	(0.9)
Spain	9.6	(0.3)	18.2	(0.3)	3.0	(0.1)	3.4	(0.1)	92.1	(0.6)
Average	10.4	(0.1)	16.8	(0.1)	2.8	(0.1)	3.9	(0.1)	83.8	(0.4)

Source: OECD, TALIS 2013 and PISA 2012 databases.

Only mathematics TALIS - PISA link teachers

	Average years of working experience as a teacher at this school		Average years of working experience as a teacher in total		Average years of working experience in other education roles		Average years of working experience in other jobs		Percentage of teachers with more than 5 years of experience as a teacher in total	
	Average	(S.E.)	Average	(S.E.)	Average	(S.E.)	Average	(S.E.)	%	(S.E.)
Australia	7.6	(0.3)	16.7	(0.5)	1.4	(0.2)	5.2	(0.2)	77.2	(1.7)
Finland	10.2	(0.4)	14.4	(0.4)	1.0	(0.2)	3.0	(0.2)	74.0	(1.4)
Latvia	16.4	(0.9)	24.2	(0.8)	2.5	(0.7)	2.6	(0.6)	96.7	(1.0)
Mexico	10.9	(1.0)	15.0	(1.1)	2.9	(0.4)	9.6	(1.7)	89.3	(3.2)
Portugal	11.2	(0.7)	19.4	(0.6)	2.7	(0.5)	1.2	(0.2)	98.4	(0.8)
Romania	14.0	(0.6)	23.1	(1.1)	5.0	(0.9)	1.6	(0.2)	95.5	(2.2)
Singapore	7.3	(0.2)	10.8	(0.3)	1.3	(0.1)	1.7	(0.1)	69.1	(1.7)
Spain	10.5	(0.5)	18.2	(0.5)	2.4	(0.2)	2.6	(0.3)	91.9	(1.0)
Average	11.0	(0.2)	17.7	(0.3)	2.4	(0.2)	3.4	(0.2)	86.5	(0.6)

Source: OECD, TALIS 2013 and PISA 2012 databases.

Table 6. School location

Percentage of teachers who work in schools located in the following types of communities

All TALIS - PISA link teachers

	Hamlet or rural area (1 000 people or fewer)		Village (1 001 to 3 000 people)		Small town (3 001 to 15 000 people)		Town (15 001 to 100 000 people)		City (100 001 to 1 000 000 people		Large city (more than 1 000 000 people)	
	%	(S.E.)	%	(S.E.)	%	(S.E.)	%	(S.E.)	%	(S.E.)	%	(S.E.)
Australia	0.0	(0.0)	4.5	(2.4)	5.4	(2.4)	24.8	(5.3)	24.7	(4.5)	40.4	(5.3)
Finland	1.4	(1.7)	12.1	(1.8)	23.1	(3.1)	31.7	(3.0)	31.6	(2.8)	a	a
Latvia	18.0	(5.0)	15.7	(4.8)	21.7	(3.8)	23.9	(3.4)	20.7	(2.1)	a	a
Mexico	5.2	(2.3)	11.6	(4.6)	16.4	(4.5)	23.3	(6.3)	23.6	(5.1)	20.0	(5.7)
Portugal	2.3	(1.5)	14.9	(3.2)	35.0	(5.0)	32.6	(4.3)	11.6	(2.6)	3.6	(0.8)
Romania	2.5	(3.0)	0.5	(0.5)	31.4	(6.5)	31.1	(6.1)	31.7	(5.6)	2.8	(1.1)
Singapore	a	a	a	a	a	a	a	a	a	a	100.0	(0.0)
Spain	0.1	(0.0)	8.3	(2.4)	19.5	(3.3)	39.3	(4.1)	24.9	(3.7)	7.9	(1.1)
Average	4.2	(1.0)	9.7	(1.2)	21.8	(1.6)	29.5	(1.8)	24.1	(1.5)	29.1	(1.3)

Source: OECD, TALIS 2013 and PISA 2012 databases.

Table 7. School type and composition

Percentage of teachers who work in schools where principals report the following school characteristics

All TALIS - PISA link teachers

	Public schools		Private schools		Schools that compete with two or more other schools for at least some of their students		Schools that compete with one other school for at least some of their students		Schools that do not compete with other schools for their students	
	%	(S.E.)	%	(S.E.)	%	(S.E.)	%	(S.E.)	%	(S.E.)
Australia	50.1	(3.7)	49.9	(3.7)	94.0	(2.5)	3.4	(1.9)	2.6	(1.6)
Finland	96.3	(1.8)	3.7	(1.8)	48.0	(4.0)	17.5	(3.2)	34.5	(4.4)
Latvia	95.4	(3.2)	4.6	(3.2)	84.8	(3.5)	10.7	(2.9)	4.5	(2.5)
Mexico	79.0	(4.9)	21.0	(4.9)	83.5	(7.1)	10.4	(6.0)	6.1	(2.8)
Portugal	91.5	(1.9)	8.5	(1.9)	59.8	(5.6)	23.5	(4.9)	16.7	(3.5)
Romania	99.1	(0.9)	0.9	(0.9)	68.5	(7.5)	10.8	(5.2)	20.8	(6.0)
Singapore	100.0	(0.0)	0.0	(0.0)	98.2	(0.1)	0.0	(0.0)	1.8	(0.1)
Spain	70.8	(2.8)	29.2	(2.8)	69.4	(3.7)	9.8	(2.5)	20.8	(3.1)
Average	85.3	(1.0)	14.7	(1.0)	75.8	(1.7)	10.7	(1.3)	13.5	(1.2)

Source: OECD, TALIS 2013 and PISA 2012 databases.

Table 8. Economic, social and cultural status and PISA mathematics achievement

School level mean Economic, Social and Cultural Status (ESCS) and PISA mathematics achievement

All TALIS - PISA link teachers

	ESCS		ESCS standard deviations		PISA mathematics achievement		PISA mathematics achievement standard deviations	
	Average	(S.E.)	Average	(S.E.)	Average	(S.E.)	Average	(S.E.)
Australia	0.3	(0.0)	0.7	(0.0)	509.4	(4.5)	78.5	(1.4)
Finland	0.3	(0.0)	0.7	(0.0)	517.7	(2.5)	78.8	(0.9)
Latvia	-0.4	(0.1)	0.7	(0.0)	486.8	(4.0)	66.0	(1.9)
Mexico	-1.0	(0.1)	0.9	(0.0)	404.1	(4.8)	55.8	(1.9)
Portugal	-0.6	(0.1)	0.9	(0.0)	469.6	(4.2)	74.1	(1.6)
Romania	-0.5	(0.1)	0.7	(0.0)	444.5	(10.2)	54.2	(1.2)
Singapore	-0.3	(0.0)	0.8	(0.0)	570.9	(0.3)	81.8	(0.1)
Spain	-0.3	(0.0)	0.9	(0.0)	481.5	(2.2)	77.4	(1.2)
Average	-0.3	(0.0)	0.8	(0.0)	485.6	(1.7)	70.8	(0.5)

Source: OECD, TALIS 2013 and PISA 2012 databases.

Table 9. Student truancy

School level mean truancy rates

All TALIS - PISA link teachers

	Student truancy rates							
	Average rate		Skipped a day of school		Skipped a class		Late to class	
	%	(S.E.)	%	(S.E.)	%	(S.E.)	%	(S.E.)
Australia	28.5	(1.1)	34.5	(1.5)	13.8	(1.3)	37.3	(1.6)
Finland	23.6	(0.7)	10.5	(0.6)	16.1	(0.7)	44.2	(1.3)
Latvia	47.4	(1.4)	21.9	(1.8)	66.2	(1.8)	54.2	(2.0)
Mexico	27.3	(2.3)	22.4	(2.2)	19.9	(2.8)	39.8	(2.8)
Portugal[1,2]	34.6	(1.0)	21.3	(0.9)	27.7	(1.0)	54.7	(1.8)
Romania	37.2	(3.0)	33.7	(4.2)	36.7	(3.4)	41.1	(2.8)
Singapore	15.9	(0.0)	14.7	(0.0)	12.6	(0.0)	20.5	(0.0)
Spain	31.3	(1.0)	27.3	(1.1)	31.8	(1.3)	34.9	(1.3)
Average	30.7	(0.6)	23.3	(0.7)	28.1	(0.7)	40.8	(0.7)

Source: OECD, TALIS 2013 and PISA 2012 databases.

Table 10. Proportion of students born abroad and whose first language is different from the language of instruction

School level mean rate of students born abroad and students whose first language is different from the language of instruction

All TALIS - PISA link teachers

	Students born abroad		Students whose first language is different from the language of instruction	
	%	(S.E.)	%	(S.E.)
Australia	9.5	(1.0)	8.9	(1.2)
Finland	3.4	(0.2)	5.2	(0.8)
Latvia	0.6	(0.1)	11.7	(2.8)
Mexico	1.3	(0.4)	2.9	(0.8)
Portugal	8.5	(1.1)	2.9	(0.4)
Romania	0.9	(0.6)	1.3	(0.4)
Singapore	13.4	(0.0)	55.4	(0.1)
Spain	11.4	(0.9)	18.5	(1.6)
Average	6.1	(0.2)	13.4	(0.5)

Source: OECD, TALIS 2013 and PISA 2012 databases.

Table 11. Relationship between effective professional development opportunities and student characteristics

Significant results of the multiple liner regressions of effective professional development opportunities with the following student characteristics[1]

	Effective professional development opportunities																			
	Dependent on:																			
	Student attitude toward school: learning outcomes		Student attitude toward school: learning activities		School mean Economic, Social and Cultural Status (ESCS)		School economic, social and cultural status variability		Percentage of students whose home language is different from country of survey		Percentage of students whose birth country is different from country of survey		School mean mathematics achievement		School mean mathematics achievement variability		Percentage of students who skipped class		Percentage of students who skipped a day of school	
	ß	(S.E.)	ß	(S.E.)	ß	(S.E.)	ß	(S.E.)	ß	(S.E.)	ß	(S.E.)	ß	(S.E.)	ß	(S.E.)	ß	(S.E.)	ß	(S.E.)
Australia							1.25	(0.53)									-1.97	(0.64)		
Finland					0.59	(0.26)														
Latvia	0.35	(0.16)													0.01	(0.01)			-1.79	(0.70)
Mexico																				
Portugal					-0.34	(0.14)														
Romania			-0.55	(0.27)	0.55	(0.23)	1.39	(0.49)												
Singapore																				
Spain																				

1. Cells are blank when no significant relationship was found. Significance was tested at the 5% level, controlling for the number of profesionnal development activities undertaken by teachers.

Source: OECD, TALIS 2013 and PISA 2012 databases.

Table 12. Relationship between mathematics teacher's effective professional development opportunities and student characteristics

Significant results of the multiple liner regressions of mathematics teachers' effective professional development opportunities with the following student characteristics[1]

	Effective professional development opportunities																									
	Dependent on:																									
	Mathematics anxiety		School mean Economic, Social and Cultural Status (ESCS)		School economic social and cultural status variability		Mathematics interest		Percentage of students whose home language is different from country of survey		Percentage of students whose birth country is different from country of survey		Mathematics self-efficacy		Students' received support from their mathematics teacher		School mean mathematics achievement		School mean mathematics achievement variability		Mathematics self-concept		Percentage of students who skipped class		Percentage of students who skipped a day of school	
	ß	(S.E.)	ß	(S.E.)	ß	(S.E.)	ß	(S.E.)	ß	(S.E.)	ß	(S.E.)	ß	(S.E.)	ß	(S.E.)	ß	(S.E.)	ß	(S.E.)	ß	(S.E.)	ß	(S.E.)	ß	(S.E.)
Australia							0.66	(0.29)			2.85	(0.91)	-0.82	(0.35)									-2.37	(1.01)		
Finland																										
Latvia																										
Mexico																	-0.02	(0.01)					4.20	(1.68)	-5.72	(2.57)
Portugal																							-3.27	(1.45)		
Romania	-1.61	(0.56)					1.27	(0.54)	-6.82	(2.71)	-9.22	(3.07)			0.87	(0.40)					0.92	(0.42)				
Singapore																										
Spain																										

1. Cells are blank when no significant relationship was found. Significance was tested at the 5% level, controlling for teacher gender and number of profesionnal development activities undertaken by teachers.

Source: OECD, TALIS 2013 and PISA 2012 databases.

Table 13. Relationship between unmet needs for professional development for teaching for diversity and student characteristics

Significant results of the multiple linear regressions of unmet needs for professional development for teaching for diversity with the following student characteristics[1]

	Need for professional development in teaching diversity																					
	Dependent on:																					
	Student attitude toward school: learning outcomes		School mean Economic, Social and Cultural Status (ESCS)		School economic, social and cultural status variability		Percentage of students whose home language is different from country of survey		Percentage of students whose birth country is different from country of survey		Percentage of students who were late to school		School mean mathematics achievement		School mean mathematics achievement variability		Percentage of students who repeated a grade		Percentage of students who skipped class		Percentage of students who skipped a day of school	
	ß	(S.E.)	ß	(S.E.)	ß	(S.E.)	ß	(S.E.)	ß	(S.E.)	ß	(S.E.)	ß	(S.E.)	ß	(S.E.)	ß	(S.E.)	ß	(S.E.)	ß	(S.E.)
Australia									-1.09	(0.55)			-0.00	(0.00)								
Finland							1.48	(0.53)					-0.00	(0.00)								
Latvia							0.89	(0.39)														
Mexico																						
Portugal																						
Romania					0.52	(0.25)																
Singapore																	1.75	(0.72)				
Spain																						

1. Cells are blank when no significant relationship was found. Significance was tested at the 5% level, controlling for teacher gender and number of profesionnal development activities undertaken by teachers.

Source: OECD, TALIS 2013 and PISA 2012 databases.

Table 14. Relationship between mathematics teachers' unmet needs for professional development for teaching for diversity and student characteristics

Significant results of the multiple linear regressions of mathematics teachers' unmet needs for professionnal development for teaching for diversity with the following student characteristics[1]

	Need for professional development in teaching diversity																									
	Dependent on:																									
	Mathematics anxiety		Mathematics teacher's classroom management		School mean Economic, Social and Cultural Status (ESCS)		School economic, social and cultural status variability		Percentage of students whose home language is different from country of survey		Percentage of students whose birth country is different from country of survey		Percentage of students who were late to school		Students' received support from their mathematics teacher		School mean mathematics achievement		School mean mathematics achievement variability		Percentage of students who repeated a grade		Percentage of students who skipped class		Percentage of students who skipped a day of school	
	ß	(S.E.)	ß	(S.E.)	ß	(S.E.)	ß	(S.E.)	ß	(S.E.)	ß	(S.E.)	ß	(S.E.)	ß	(S.E.)	ß	(S.E.)	ß	(S.E.)	ß	(S.E.)	ß	(S.E.)	ß	(S.E.)
Australia	-0.65	(0.33)																								
Finland			-0.82	(0.25)					3.64	(0.76)	-4.46	(1.80)	-1.16	(0.58)	0.67	(0.27)									3.25	(1.64)
Latvia																	-0.01	(0.01)					-2.95	(1.07)		
Mexico									12.14	(2.92)	13.35	(5.28)									-2.38	(0.83)			3.42	(1.52)
Portugal																										
Romania					1.35	(0.40)	2.58	(1.01)											-0.05	(0.01)						
Singapore							-1.24	(0.62)													3.24	(1.52)				
Spain																	0.01	(0.00)	0.01	(0.01)	1.53	(0.70)	-2.17	(0.83)		

1. Cells are blank when no significant relationship was found. Significance was tested at the 5% level, controlling for teacher gender and number of profesionnal development activities undertaken by teachers.

Source: OECD, TALIS 2013 and PISA 2012 databases.

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Table 15. Relationship between unmet needs for professional development in subject matter and pedagogy and student characteristics

Significant results of the multiple linear regressions of unmet needs for professional development in subject matter and pedagogy with the following student characteristics[1]

	Need for professional development in pedagogy																					
	Dependent on:																					
	Student attitude toward school: learning outcomes		School mean economic, social and cultural status (ESCS)		School economic, social and cultural status variability		Percentage of students whose home language is different from country of survey		Percentage of students whose birth country is different from country of survey		Percentage of students who were late to school		School mean mathematics achievement		School mean mathematics achievement variability		Percentage of students who repeated a grade		Percentage of students who skipped class		Percentage of students who skipped a day of school	
	ß	(S.E.)	ß	(S.E.)	ß	(S.E.)	ß	(S.E.)	ß	(S.E.)	ß	(S.E.)	ß	(S.E.)	ß	(S.E.)	ß	(S.E.)	ß	(S.E.)	ß	(S.E.)
Australia									-1.12	(0.53)												
Finland																						
Latvia																						
Mexico	0.49	(0.21)													0.02	(0.01)						
Portugal																						
Romania					-0.70	(0.34)									0.02	(0.01)						
Singapore																						
Spain																						

1. Cells are blank when no significant relationship was found. Significance was tested at the 5% level, controlling for teacher gender and number of profesionnal development activities undertaken by teachers.

Source: OECD, TALIS 2013 and PISA 2012 databases.

Table 16. Relationship between mathematics teacher unmet needs for professional development in subject matter and pedagogy and student characteristics

Significant results of the multiple linear regressions of mathematics teachers' unmet needs for professional development in subject matter and pedagogy with the following student characteristics[1]

	Need for professional development in pedagogy																									
	Dependent on:																									
	Mathematics anxiety		Mathematics teacher's classroom management		School mean economic, social and cultural status (ESCS)		School economic, social and cultural status variability		Percentage of students whose home language is different from country of survey		Percentage of students whose birth country is different from country of survey		Percentage of students who were late to school		Students' received support from their mathematics teacher		School mean mathematics achievement		School mean mathematics achievement variability		Percentage of students who repeated a grade		Percentage of students who skipped class		Percentage of students who skipped a day of school	
	ß	(S.E.)	ß	(S.E.)	ß	(S.E.)	ß	(S.E.)	ß	(S.E.)	ß	(S.E.)	ß	(S.E.)	ß	(S.E.)	ß	(S.E.)	ß	(S.E.)	ß	(S.E.)	ß	(S.E.)	ß	(S.E.)
Australia	-1.21	(0.48)																								
Finland													-1.57	(0.49)	0.10	(0.02)										
Latvia																							-2.32	(1.04)		
Mexico											16.95	(4.55)							-2.13	(0.96)						
Portugal					-0.62	(0.29)																				
Romania					1.11	(0.38)			-5.16	(1.70)	9.53	(2.88)					-0.02	(0.01)			-1.04	(0.36)				
Singapore															0.06	(0.02)										
Spain	0.65	(0.32)													0.09	(0.02)										

1. Cells are blank when no significant relationship was found. Significance was tested at the 5% level, controlling for teacher gender and number of profesionnal development activities undertaken by teachers.

Source: OECD, OECD, TALIS 2013 and PISA 2012 databases.

Table 17. Teaching beliefs and teaching practices

Percentages of teachers with high/low constructivist beliefs (above/below the country mean) who engage in the following teaching practices

All TALIS-PISA link teachers

	HIGH constructivist beliefs		Percent of teachers holding HIGH Constructivist beliefs who use the following teaching practices frequently to all of the time															
			I present a summary of recently learned content		Students work in small groups to come up with a joint solution to a problem		I give different work to students with difficulties or those who advance fast		I refer to a problem from everyday life or work		I let students practice similar tasks until every student has understood		I check my students' exercise books or homework		Students work on projects that require at least one week to complete		Students use ICT for projects or class work	
	%	(S.E)	%	(S.E)	%	(S.E)	%	(S.E)	%	(S.E)	%	(S.E)	%	(S.E)	%	(S.E)	%	(S.E)
Australia	43.5	(1.4)	77.7	(1.1)	52.4	(2.4)	42.1	(2.5)	77.7	(1.8)	67.9	(2.0)	67.7	(2.0)	51.9	(2.1)	75.2	(2.0)
Finland	42.2	(0.9)	69.7	(1.6)	44.0	(1.6)	39.3	(2.1)	71.3	(1.4)	52.5	(1.9)	61.3	(1.6)	18.7	(1.2)	23.8	(1.6)
Latvia	47.3	(1.6)	83.0	(1.7)	40.5	(2.5)	53.6	(3.1)	89.6	(1.7)	85.8	(1.4)	77.3	(2.1)	19.6	(1.8)	40.8	(2.3)
Mexico	55.1	(1.8)	70.7	(2.2)	77.4	(2.7)	30.6	(2.3)	87.7	(1.7)	83.1	(2.3)	91.0	(1.2)	59.3	(3.2)	64.9	(3.2)
Portugal	51.9	(1.1)	84.2	(1.2)	56.6	(1.8)	52.6	(2.0)	73.0	(1.4)	58.6	(1.5)	63.2	(2.0)	26.2	(1.5)	42.6	(2.3)
Romania	47.7	(1.2)	80.2	(1.1)	56.6	(2.6)	54.4	(2.7)	60.2	(2.0)	81.3	(1.8)	79.3	(1.9)	25.4	(1.9)	38.0	(2.5)
Singapore	41.9	(0.7)	75.6	(1.1)	34.4	(1.0)	25.2	(1.1)	67.3	(1.3)	70.8	(1.2)	84.3	(0.9)	20.9	(1.1)	28.2	(1.2)
Spain	42.1	(0.8)	73.3	(1.0)	40.6	(2.1)	44.9	(1.4)	84.8	(1.2)	76.3	(1.4)	79.5	(1.4)	31.6	(1.5)	44.2	(1.6)
Average	46.5	(0.4)	76.8	(0.5)	50.3	(0.8)	42.8	(0.8)	76.5	(0.6)	72.1	(0.6)	75.4	(0.6)	31.7	(0.7)	44.7	(0.8)

Source: OECD, TALIS 2013 and PISA 2012 databases.

All TALIS - PISA link teachers

	LOW constructivist beliefs		Percent of teachers holding LOW Constructivist beliefs who use the following teaching practices frequently to all of the time															
			I present a summary of recently learned content		Students work in small groups to come up with a joint solution to a problem		I give different work to students with difficulties or those who advance fast		I refer to a problem from everyday life or work		I let students practice similar tasks until every student has understood		I check my students' exercise books or homework		Students work on projects that require at least one week to complete		Students use ICT for projects or class work	
	%	(S.E)	%	(S.E)	%	(S.E)	%	(S.E)	%	(S.E)	%	(S.E)	%	(S.E)	%	(S.E)	%	(S.E)
Australia	56.5	(1.4)	69.2	(1.6)	41.0	(1.5)	38.5	(1.7)	69.1	(1.3)	61.3	(1.5)	63.6	(1.7)	49.4	(2.0)	68.8	(1.9)
Finland	57.8	(0.9)	60.6	(1.5)	31.9	(1.4)	33.0	(1.7)	60.5	(1.3)	46.8	(1.2)	58.8	(1.3)	12.1	(1.0)	14.7	(1.2)
Latvia	52.7	(1.6)	76.1	(1.9)	31.7	(2.3)	50.9	(2.3)	83.8	(1.5)	81.0	(1.6)	74.3	(1.8)	18.6	(1.4)	35.7	(2.2)
Mexico	44.9	(1.8)	58.8	(3.2)	74.2	(4.4)	28.8	(2.9)	80.1	(2.8)	80.2	(2.2)	94.9	(1.0)	47.8	(3.6)	66.9	(3.0)
Portugal	48.1	(1.1)	82.4	(1.4)	50.2	(1.6)	51.8	(1.7)	59.6	(1.7)	59.3	(1.6)	59.7	(1.8)	21.8	(1.4)	35.6	(1.5)
Romania	52.3	(1.2)	74.0	(2.7)	52.3	(2.2)	51.5	(2.2)	51.3	(3.4)	77.4	(1.5)	80.9	(1.4)	24.0	(2.1)	29.6	(1.5)
Singapore	58.1	(0.7)	68.5	(1.0)	28.6	(1.1)	22.7	(1.0)	55.6	(1.2)	68.0	(1.0)	83.4	(0.8)	22.2	(1.0)	25.0	(1.0)
Spain	57.9	(0.8)	69.8	(1.2)	32.6	(1.4)	35.2	(1.5)	76.1	(1.2)	71.3	(1.4)	78.0	(1.5)	24.9	(1.0)	35.1	(1.5)
Average	53.5	(0.4)	69.9	(0.7)	42.8	(0.8)	39.0	(0.7)	67.0	(0.7)	68.2	(0.5)	74.2	(0.5)	27.6	(0.7)	38.9	(0.6)

Source: OECD, TALIS 2013 and PISA 2012 databases.

Table 18. Mathematics teaching strategies and time on homework

Percentage of mathematics teachers who report using the following strategies in their class and the expected time to complete homework

Only mathematics TALIS-PISA link teachers

	I have students work in groups								I have students complete a test or quiz							
	Very unlikely		Somewhat unlikely		Somewhat likely		Very likely		Very unlikely		Somewhat unlikely		Somewhat likely		Very likely	
	%	(S.E)	%	(S.E)	%	(S.E)	%	(S.E)	%	(S.E)	%	(S.E)	%	(S.E)	%	(S.E)
Australia	7.2	(1.2)	33.0	(2.4)	40.5	(2.4)	19.3	(1.9)	7.8	(1.4)	32.9	(2.7)	40.8	(2.6)	18.4	(1.7)
Finland	11.2	(1.4)	45.3	(2.2)	33.9	(2.3)	9.6	(1.7)	16.0	(1.5)	48.0	(1.9)	14.5	(1.3)	21.5	(1.8)
Latvia	5.5	(2.0)	38.1	(4.9)	40.4	(4.0)	16.0	(3.7)	0.2	(0.1)	6.6	(1.4)	51.6	(3.7)	41.7	(3.8)
Mexico	0.6	(0.3)	7.7	(2.9)	25.7	(4.1)	66.0	(5.0)	2.8	(1.0)	7.6	(1.8)	33.0	(3.1)	56.6	(3.7)
Portugal	9.3	(2.3)	28.9	(2.8)	50.6	(3.4)	11.2	(2.2)	2.4	(0.6)	13.2	(1.6)	55.6	(2.5)	28.8	(2.2)
Romania	5.1	(1.5)	28.1	(4.3)	49.2	(5.0)	17.6	(3.5)	2.7	(0.8)	31.2	(3.9)	47.8	(4.0)	18.3	(2.9)
Singapore	6.5	(0.8)	30.6	(1.7)	50.7	(1.7)	12.2	(1.0)	1.3	(0.4)	14.7	(1.2)	55.1	(1.6)	28.8	(1.2)
Spain	13.9	(1.6)	31.5	(2.3)	43.0	(1.9)	11.7	(1.5)	4.5	(0.8)	23.1	(2.0)	30.3	(2.3)	42.1	(2.2)
Average	7.4	(0.5)	30.4	(1.1)	41.8	(1.2)	20.4	(1.0)	4.7	(0.3)	22.2	(0.8)	41.1	(1.0)	32.0	(0.9)

	Time you expect an average student to work on homework									
	15 minutes or less		16 to 30 minutes		31 to 60 minutes		More than 60 minutes		Length of time to complete homework assignments varies a great deal	
	%	(S.E)	%	(S.E)	%	(S.E)	%	(S.E)	%	(S.E)
Australia	13.5	(1.7)	49.5	(2.4)	25.0	(3.0)	3.6	(1.0)	8.3	(1.3)
Finland	59.7	(2.4)	22.0	(1.9)	1.1	(0.4)	0.0	(0.0)	17.2	(1.7)
Latvia	17.9	(3.2)	53.0	(4.7)	8.6	(1.5)	0.0	(0.0)	20.5	(3.8)
Mexico	7.1	(2.3)	33.1	(4.1)	44.1	(4.7)	4.3	(1.2)	11.4	(2.5)
Portugal	22.0	(2.5)	52.5	(2.4)	15.6	(2.4)	0.5	(0.2)	9.4	(1.5)
Romania	7.7	(3.4)	16.0	(2.0)	54.7	(4.4)	11.1	(3.1)	10.4	(5.2)
Singapore	1.0	(0.4)	26.1	(1.6)	54.9	(1.9)	8.4	(1.0)	9.6	(0.9)
Spain	12.1	(1.5)	52.6	(2.0)	21.3	(1.5)	1.2	(0.6)	12.7	(1.6)
Average	17.6	(0.8)	38.1	(1.0)	28.2	(1.0)	3.6	(0.5)	12.4	(0.9)

Source: OECD, TALIS 2013 and PISA 2012 databases.

Table 19. Mathematics teaching practices

Percentage of mathematics teachers who report using the following practices in their class

Only mathematics TALIS-PISA link teachers

	Explicitly state learning goals								Ask short, fact-based questions							
	Never or almost never		Occasionally		Frequently		In all or nearly all lessons		Never or almost never		Occasionally		Frequently		In all or nearly all lessons	
	%	(S.E)	%	(S.E)	%	(S.E)	%	(S.E)	%	(S.E)	%	(S.E)	%	(S.E)	%	(S.E)
Australia	1.6	(0.7)	13.5	(1.6)	51.1	(2.2)	33.8	(2.2)	0.5	(0.2)	10.2	(1.3)	55.8	(2.4)	33.5	(2.8)
Finland	1.6	(0.4)	25.0	(2.2)	52.7	(2.3)	20.7	(1.8)	0.8	(0.4)	14.7	(1.4)	60.7	(2.4)	23.9	(2.2)
Latvia	0.4	(0.4)	0.7	(0.5)	27.9	(4.9)	71.1	(4.9)	0.0	(0.0)	4.1	(1.2)	61.0	(5.0)	34.9	(4.8)
Mexico	0.3	(0.3)	13.2	(3.7)	56.9	(4.5)	29.6	(4.6)	0.0	(0.0)	4.0	(1.3)	59.3	(5.2)	36.6	(4.9)
Portugal	0.2	(0.1)	6.8	(1.1)	63.4	(2.9)	29.5	(2.9)	0.4	(0.3)	13.7	(2.4)	49.2	(3.1)	36.7	(2.4)
Romania	0.1	(0.1)	2.2	(0.9)	20.5	(3.0)	77.2	(3.2)	0.2	(0.1)	5.4	(1.9)	36.5	(6.9)	57.9	(6.9)
Singapore	0.9	(0.3)	10.8	(1.1)	51.6	(1.8)	36.7	(1.8)	0.6	(0.3)	14.4	(1.4)	60.2	(2.0)	24.8	(1.5)
Spain	0.6	(0.2)	8.7	(1.2)	50.2	(2.1)	40.5	(2.2)	1.0	(0.5)	17.4	(1.6)	60.3	(2.1)	21.3	(1.6)
Average	0.7	(0.1)	10.1	(0.6)	46.8	(1.1)	42.4	(1.1)	0.4	(0.1)	10.5	(0.6)	55.4	(1.4)	33.7	(1.4)

Source: OECD, TALIS 2013 and PISA 2012 databases.

Expect students to explain their thinking on complex problems								Give students a choice of problems to solve							
Never or almost never		Occasionally		Frequently		In all or nearly all lessons		Never or almost never		Occasionally		Frequently		In all or nearly all lessons	
%	(S.E)	%	(S.E)	%	(S.E)	%	(S.E)	%	(S.E)	%	(S.E)	%	(S.E)	%	(S.E)
3.1	(0.9)	23.7	(2.0)	48.3	(2.6)	24.9	(2.5)	17.5	(1.9)	48.1	(2.6)	27.0	(2.1)	7.5	(1.5)
3.6	(1.0)	26.1	(1.8)	54.3	(2.1)	16.0	(1.7)	3.0	(0.7)	22.1	(1.9)	43.0	(2.4)	32.0	(2.0)
1.6	(1.7)	28.5	(4.6)	53.6	(4.6)	16.2	(2.4)	11.1	(2.5)	75.6	(3.8)	10.2	(2.4)	3.1	(1.8)
0.7	(0.5)	13.7	(3.4)	54.3	(5.5)	31.3	(4.9)	11.6	(3.0)	52.9	(5.1)	27.5	(4.4)	8.0	(2.5)
0.1	(0.1)	4.8	(1.5)	50.2	(3.0)	44.8	(3.5)	32.6	(3.1)	61.2	(3.1)	6.1	(1.1)	0.2	(0.1)
6.5	(3.4)	18.2	(3.1)	37.9	(6.6)	37.4	(5.1)	24.1	(3.8)	59.8	(4.9)	13.4	(3.3)	2.7	(0.8)
3.3	(0.6)	37.5	(1.5)	49.1	(1.4)	10.0	(1.0)	26.6	(1.6)	41.7	(1.5)	25.3	(1.4)	6.5	(0.9)
4.9	(0.8)	36.9	(2.5)	45.8	(1.9)	12.4	(1.5)	47.7	(2.2)	33.6	(2.1)	13.6	(1.3)	5.0	(0.8)
3.0	(0.5)	23.7	(1.0)	49.2	(1.4)	24.1	(1.1)	21.8	(0.9)	49.4	(1.2)	20.7	(0.9)	8.1	(0.5)

Source: OECD, TALIS 2013 and PISA 2012 databases.

Connect mathematics concepts and teach their use outside of school								Encourage students to solve problems more than one way							
Never or almost never		Occasionally		Frequently		In all or nearly all lessons		Never or almost never		Occasionally		Frequently		In all or nearly all lessons	
%	(S.E)	%	(S.E)	%	(S.E)	%	(S.E)	%	(S.E)	%	(S.E)	%	(S.E)	%	(S.E)
1.0	(0.3)	24.6	(2.3)	51.8	(2.5)	22.6	(2.5)	1.3	(0.5)	27.9	(2.3)	51.2	(2.2)	19.6	(2.2)
3.3	(1.1)	46.2	(2.2)	41.1	(1.9)	9.4	(1.5)	6.9	(1.2)	45.7	(2.2)	38.0	(2.0)	9.4	(1.6)
1.0	(0.8)	21.0	(3.3)	61.3	(5.1)	16.7	(3.6)	0.0	(0.0)	29.2	(5.6)	53.4	(5.9)	17.4	(3.1)
0.4	(0.3)	13.9	(2.5)	54.4	(4.0)	31.3	(4.1)	0.0	(0.0)	8.0	(2.8)	54.9	(3.6)	37.1	(4.4)
0.3	(0.1)	10.7	(1.8)	64.6	(2.6)	24.4	(2.1)	0.0	(0.0)	9.7	(1.4)	60.5	(3.2)	29.8	(2.8)
0.4	(0.2)	22.6	(2.5)	62.9	(3.6)	14.2	(3.3)	0.1	(0.1)	9.1	(2.1)	66.1	(5.1)	24.7	(4.4)
2.0	(0.5)	42.9	(1.8)	46.0	(1.8)	9.1	(0.8)	1.2	(0.5)	20.7	(1.5)	64.2	(1.8)	13.9	(1.1)
1.4	(0.4)	26.5	(1.9)	56.5	(1.9)	15.5	(1.6)	0.8	(0.3)	19.5	(1.7)	57.5	(2.1)	22.3	(1.8)
1.2	(0.2)	26.1	(0.8)	54.8	(1.1)	17.9	(0.9)	1.3	(0.2)	21.2	(1.0)	55.7	(1.3)	21.8	(1.0)

Source: OECD, TALIS 2013 and PISA 2012 databases.

Require students to provide explanations of how they solve problems								Require students to work on projects that take more than a class period							
Never or almost never		Occasionally		Frequently		In all or nearly all lessons		Never or almost never		Occasionally		Frequently		In all or nearly all lessons	
%	(S.E)	%	(S.E)	%	(S.E)	%	(S.E)	%	(S.E)	%	(S.E)	%	(S.E)	%	(S.E)
11.9	(1.6)	30.2	(2.4)	32.7	(2.4)	25.2	(2.7)	20.8	(2.3)	50.8	(2.1)	21.7	(1.7)	6.6	(1.3)
12.8	(1.7)	13.6	(1.5)	36.9	(2.4)	36.7	(2.1)	71.7	(1.7)	26.6	(1.8)	1.4	(0.5)	0.4	(0.2)
5.1	(2.2)	31.5	(5.1)	41.6	(4.7)	21.8	(3.6)	20.8	(2.5)	73.9	(2.9)	3.8	(1.3)	1.5	(0.6)
6.6	(2.1)	29.7	(3.9)	48.9	(5.4)	14.7	(3.8)	13.7	(2.8)	49.0	(4.0)	28.7	(3.9)	8.7	(2.7)
1.4	(0.6)	12.2	(1.7)	54.2	(2.6)	32.2	(2.6)	37.5	(2.6)	44.5	(2.9)	15.4	(2.1)	2.6	(0.8)
7.7	(1.8)	22.1	(3.5)	42.8	(5.9)	27.4	(4.2)	9.6	(1.8)	59.3	(6.8)	25.6	(6.2)	5.5	(1.8)
21.0	(1.5)	30.6	(1.6)	32.8	(1.8)	15.6	(1.2)	43.2	(1.7)	45.5	(1.7)	9.8	(1.1)	1.5	(0.4)
16.5	(1.5)	29.8	(1.9)	37.8	(2.3)	15.9	(1.2)	44.8	(2.5)	46.2	(2.2)	7.5	(1.1)	1.4	(0.5)
10.4	(0.6)	25.0	(1.0)	41.0	(1.3)	23.7	(1.0)	32.8	(0.8)	49.5	(1.2)	14.2	(1.0)	3.5	(0.5)

Source: OECD, TALIS 2013 and PISA 2012 databases.

Go over homework problems that students were not able to solve								Encourage students to work together to solve problems							
Never or almost never		Occasionally		Frequently		In all or nearly all lessons		Never or almost never		Occasionally		Frequently		In all or nearly all lessons	
%	(S.E)	%	(S.E)	%	(S.E)	%	(S.E)	%	(S.E)	%	(S.E)	%	(S.E)	%	(S.E)
3.9	(1.0)	23.8	(2.5)	46.7	(2.6)	25.6	(2.1)	2.5	(0.8)	21.6	(2.3)	53.2	(2.3)	22.7	(1.7)
1.7	(0.6)	7.3	(1.0)	42.8	(1.9)	48.2	(2.0)	2.8	(0.6)	30.7	(1.8)	47.6	(2.2)	18.8	(1.7)
0.0	(0.0)	13.2	(3.1)	54.3	(5.1)	32.5	(4.2)	0.9	(0.5)	32.2	(5.0)	51.3	(5.0)	15.7	(3.0)
1.4	(0.9)	7.7	(1.7)	57.5	(5.7)	33.4	(5.2)	0.0	(0.0)	12.7	(3.7)	51.4	(4.9)	35.9	(6.1)
2.7	(0.9)	3.9	(0.9)	29.6	(2.6)	63.9	(2.7)	3.2	(0.8)	27.1	(3.8)	52.7	(3.6)	17.0	(2.2)
0.1	(0.1)	2.9	(1.0)	36.5	(4.4)	60.6	(4.8)	0.7	(0.3)	16.2	(2.4)	61.8	(3.6)	21.3	(3.2)
0.7	(0.3)	8.1	(0.8)	55.9	(1.6)	35.3	(1.4)	2.0	(0.5)	21.3	(1.4)	59.8	(1.4)	16.9	(1.2)
0.4	(0.2)	3.4	(1.0)	31.0	(1.7)	65.3	(1.8)	4.2	(0.7)	36.1	(2.0)	46.3	(2.2)	13.4	(1.6)
1.3	(0.2)	8.8	(0.6)	44.3	(1.3)	45.6	(1.2)	2.1	(0.2)	24.7	(1.1)	53.0	(1.2)	20.2	(1.1)

Source: OECD, TALIS 2013 and PISA 2012 databases.

Table 20. Mathematics teacher use of ICT in their class

Percentage of mathematics teachers who report using the following types of ICT in their class

	Drill and practice software								Topic-specific software							
	Never or almost never		Occasionally		Frequently		Always or almost always		Never or almost never		Occasionally		Frequently		Always or almost always	
	%	(S.E)	%	(S.E)	%	(S.E)	%	(S.E)	%	(S.E)	%	(S.E)	%	(S.E)	%	(S.E)
Australia	38.1	(3.0)	39.6	(2.1)	18.3	(2.2)	3.9	(0.9)	24.1	(2.2)	54.3	(2.5)	19.3	(2.0)	2.3	(0.6)
Finland	73.1	(3.0)	24.2	(2.8)	2.6	(0.9)	0.1	(0.1)	48.1	(2.6)	42.6	(2.2)	8.5	(2.5)	0.7	(0.3)
Latvia	35.3	(4.2)	48.1	(4.6)	15.2	(3.5)	1.3	(0.7)	28.4	(3.8)	60.7	(4.0)	9.7	(1.8)	1.1	(0.5)
Mexico	36.7	(4.6)	49.9	(4.7)	11.6	(2.3)	1.8	(0.7)	33.1	(4.3)	46.5	(6.1)	18.9	(4.2)	1.5	(0.7)
Portugal	41.4	(2.6)	38.9	(2.6)	16.8	(1.9)	2.9	(1.1)	16.7	(2.2)	40.8	(2.7)	38.3	(3.8)	4.2	(1.0)
Romania	64.4	(4.7)	34.2	(4.7)	1.3	(0.4)	0.1	(0.1)	45.1	(4.7)	46.8	(4.3)	7.7	(3.1)	0.4	(0.2)
Singapore	33.1	(1.6)	41.1	(1.8)	20.0	(1.4)	5.7	(0.7)	18.7	(1.4)	63.7	(1.8)	15.9	(1.4)	1.7	(0.4)
Spain	46.6	(1.9)	40.8	(1.8)	10.8	(1.4)	1.8	(0.5)	45.6	(2.3)	42.0	(1.9)	10.8	(1.2)	1.5	(0.5)
Average	46.1	(1.2)	39.6	(1.2)	12.1	(0.7)	2.2	(0.2)	32.5	(1.1)	49.7	(1.2)	16.1	(1.0)	1.7	(0.2)

Source: OECD, TALIS 2013 and PISA 2012 databases.

Spreadsheets or other data analysis software								Software for assessing student learning							
Never or almost never		Occasionally		Frequently		Always or almost always		Never or almost never		Occasionally		Frequently		Always or almost always	
%	(S.E)	%	(S.E)	%	(S.E)	%	(S.E)	%	(S.E)	%	(S.E)	%	(S.E)	%	(S.E)
23.9	(1.8)	59.3	(2.7)	15.4	(2.3)	1.3	(0.5)	41.6	(2.8)	38.5	(2.1)	16.7	(1.9)	3.2	(0.8)
69.9	(2.9)	27.9	(2.7)	2.2	(1.1)	0.0	(0.0)	81.4	(2.1)	15.8	(1.9)	2.2	(0.7)	0.6	(0.3)
38.1	(4.4)	52.1	(4.2)	8.8	(2.4)	1.0	(0.7)	33.9	(4.6)	38.5	(4.4)	16.4	(3.5)	11.2	(3.0)
46.9	(4.6)	38.0	(4.9)	14.2	(3.8)	1.0	(0.5)	50.4	(4.8)	33.8	(5.0)	14.4	(3.0)	1.4	(0.6)
31.4	(2.5)	48.9	(2.9)	16.8	(1.8)	2.9	(0.8)	34.0	(2.5)	29.5	(2.2)	23.4	(3.0)	13.1	(1.8)
59.8	(4.3)	34.1	(4.9)	4.8	(1.3)	1.3	(1.2)	49.8	(5.9)	43.7	(5.7)	6.4	(1.9)	0.1	(0.1)
44.5	(1.8)	48.8	(1.8)	5.6	(0.8)	1.2	(0.4)	38.7	(1.9)	48.5	(2.0)	11.2	(1.0)	1.5	(0.4)
56.2	(2.3)	35.9	(2.2)	6.9	(1.3)	1.0	(0.4)	66.3	(2.0)	23.2	(1.9)	7.9	(1.4)	2.6	(0.6)

Source: OECD, TALIS 2013 and PISA 2012 databases.

Internet resources							
Never or almost never		Occasionally		Frequently		Always or almost always	
%	(S.E)	%	(S.E)	%	(S.E)	%	(S.E)
13.8	(2.0)	49.9	(2.4)	31.6	(2.2)	4.7	(1.2)
36.2	(2.6)	53.7	(2.7)	8.6	(1.5)	1.5	(0.5)
3.2	(1.9)	40.0	(4.8)	49.5	(4.7)	7.2	(1.7)
10.8	(1.7)	30.1	(4.2)	50.2	(4.9)	9.0	(3.0)
15.1	(1.8)	38.9	(2.3)	38.3	(2.6)	7.6	(1.7)
24.9	(5.7)	46.8	(6.6)	27.5	(3.8)	0.8	(0.3)
18.4	(1.3)	59.5	(1.7)	19.3	(1.2)	2.8	(0.6)
19.0	(1.9)	48.1	(2.3)	27.2	(1.8)	5.7	(1.0)
17.7	(1.0)	45.9	(1.3)	31.5	(1.1)	4.9	(0.5)

Source: OECD, TALIS 2013 and PISA 2012 databases.

Table 21. Relationship between mathematics teacher project based teaching and student and teacher characteristics

Significant results of the logistic regressions of mathematics teacher project based teaching with the following student and teacher characteristics[1]

All TALIS-PISA link teachers

Use of projects that require at least one week to complete

Dependent on:

	Student mathematics anxiety		Student mathematics self-efficacy		Student mathematics work ethic		Students whose home language is different from country of survey		Student truancy mean		School mean economic, social and cultural status (ESCS)		School economic, social and cultural status variability		School mean mathematics achievement		School mean mathematics achievement variability	
	ß	(S.E.)	ß	(S.E.)	ß	(S.E.)	ß	(S.E.)	ß	(S.E.)	ß	(S.E.)	ß	(S.E.)	ß	(S.E.)	ß	(S.E.)
Australia							-3.61	(1.83)										
Finland																		
Latvia	22.64	(8.19)									2.96	(1.31)			-0.06	(0.02)	-0.14	(0.06)
Mexico							-121.81	(49.99)										
Portugal	4.04	(1.76)			2.17	(0.90)											0.05	(0.03)
Romania					1.89	(0.61)			4.15	(1.76)	1.30	(0.52)						
Singapore					1.29	(0.53)									0.01	(0.00)		
Spain					1.19	(0.59)					-0.98	(0.39)			0.02	(0.01)		

	Female teacher * Student mathematics anxiety		Female teacher * School mean economic, social and cultural status (ESCS)		Female teacher * School economic, social and cultural status variability		Female teacher * School mean mathematics achievement		Female teacher * School mean mathematics achievement variability		Years of experience as a teacher * Student mathematics anxiety		Years of experience as a teacher * Student mathematics self-efficacy		Years of experience as a teacher * School economic, social and cultural status variability		Years of experience as a teacher * Students whose home language is different from country of survey	
	ß	(S.E.)	ß	(S.E.)	ß	(S.E.)	ß	(S.E.)	ß	(S.E.)	ß	(S.E.)	ß	(S.E.)	ß	(S.E.)	ß	(S.E.)
Australia											0.68	(0.34)						
Finland																		
Latvia																		
Mexico																	-122.75	(50.20)
Portugal											6.41	(2.35)	4.09	(1.45)			38.88	(11.19)
Romania																		
Singapore																		
Spain																		

1. Cells are blank when no significant relationship was found. Significance was tested at the 5% level, controlling for teacher gender, years of experience as a teacher, school size (number of students in the school), number of school management personnel, mathematics teacher and professional development activities undertaken by teachers.

Source: OECD, TALIS 2013 and PISA 2012 databases.

Table 22. Relationship between teacher self-efficacy and student variables

Significant results of the multiple linear regressions of teacher self-efficacy with the following student characteristics[1]

All TALIS - PISA link teachers

	Teacher self-efficacy													
	Dependent on:													
	School mean economic, social and cultural status (ESCS)		Student mathematics self-efficacy (school mean)		School mean mathematics achievement		Student mathematics work ethic (school mean)		Student sense of belonging to school (school mean)		Student intrinsic motivation to learn mathematics (school mean)		Student attitude towards school: learning activities (school mean)	
	ß	(S.E.)	ß	(S.E.)	ß	(S.E.)	ß	(S.E.)	ß	(S.E.)	ß	(S.E.)	ß	(S.E.)
Australia														
Finland														
Latvia	0.29	(0.13)												
Mexico							1.49	(0.44)						
Portugal									0.35	(0.11)				
Romania	-0.31	(0.12)												
Singapore														
Spain	0.28	(0.13)							0.38	(0.13)				

1. Cells are blank when no significant relationship was found. Significance was tested at the 5% level, controlling for teacher gender, work experience as a teacher in total and mathematics teacher.

Source: OECD, TALIS 2013 and PISA 2012 databases.

Table 23. Relationship between teacher self-efficacy in classroom management and student variables

Significant results of the multiple linear regressions of teacher efficacy in classroom management with the following student characteristics[1]

All TALIS - PISA link teachers

	Teacher efficacy in classroom management													
	Dependent on:													
	School mean economic, social and cultural status (ESCS)		Student mathematics self-efficacy (school mean)		School mean mathematics achievement		Student mathematics work ethic (school mean)		Student sense of belonging to school (school mean)		Student intrinsic motivation to learn mathematics (school mean)		Student attitude towards school: learning activities (school mean)	
	ß	(S.E.)	ß	(S.E.)	ß	(S.E.)	ß	(S.E.)	ß	(S.E.)	ß	(S.E.)	ß	(S.E.)
Australia														
Finland														
Latvia														
Mexico							1.30	(0.42)						
Portugal									0.41	(0.13)				
Romania							0.25	(0.11)						
Singapore														
Spain														

1. Cells are blank when no significant relationship was found. Significance was tested at the 5% level, controlling for teacher gender, work experience as a teacher in total and mathematics teacher.

Source: OECD, TALIS 2013 and PISA 2012 databases.

Table 24. Relationship between teacher self-efficacy in instruction and student variables

Significant results of the multiple linear regressions of teacher efficacy in instruction with the following student characteristics[1]

All TALIS - PISA link teachers

	Teacher efficacy in instruction													
	Dependent on:													
	School mean economic, social and cultural status (ESCS)		Student mathematics self-efficacy (school mean)		School mean mathematics achievement		Student mathematics work ethic (school mean)		Student sense of belonging to school (school mean)		Student intrinsic motivation to learn mathematics (school mean)		Student attitude towards school: learning activities (school mean)	
	ß	(S.E.)	ß	(S.E.)	ß	(S.E.)	ß	(S.E.)	ß	(S.E.)	ß	(S.E.)	ß	(S.E.)
Australia														
Finland														
Latvia	0.41	(0.13)			-0.00	(0.00)								
Mexico							1.37	(0.53)						
Portugal									0.32	(0.12)				
Romania	-0.28	(0.12)									0.42	(0.15)		
Singapore	0.30	(0.15)												
Spain									0.53	(0.12)				

1. Cells are blank when no significant relationship was found. Significance was tested at the 5% level, controlling for teacher gender, work experience as a teacher in total and mathematics teacher.

Source: OECD, TALIS 2013 and PISA 2012 databases.

Table 25. Relationship between teacher self-efficacy in teaching mathematics and student variables

Significant results of the multiple linear regressions of teacher self-efficacy in teaching mathematics with the following student characteristics[1]

All TALIS - PISA link teachers

	Teacher self-efficacy in teaching mathematics													
	Dependent on:													
	School mean economic, social and cultural status (ESCS)		Student mathematics self-efficacy (school mean)		School mean mathematics achievement		Student mathematics work ethic (school mean)		Student sense of belonging to school (school mean)		Student intrinsic motivation to learn mathematics (school mean)		Student attitude towards school: learning activities (school mean)	
	ß	(S.E.)	ß	(S.E.)	ß	(S.E.)	ß	(S.E.)	ß	(S.E.)	ß	(S.E.)	ß	(S.E.)
Australia													0.99	(0.31)
Finland														
Latvia														
Mexico														
Portugal														
Romania					0.01	(0.00)								
Singapore					0.01	(0.00)								
Spain									0.93	(0.38)				

1. Cells are blank when no significant relationship was found. Significance was tested at the 5% level, controlling for teacher gender, work experience as a teacher in total and mathematics teacher.

Source: OECD, TALIS 2013 and PISA 2012 databases.

Table 26. Multilevel model - Relationship between teacher self-efficacy and teacher and student variables

All TALIS - PISA link teachers

	Teacher self-efficacy															
	Dependent on:															
	School mean economic, social and cultural status (ESCS)		School economic, social and cultural status variability		School mean mathematics achievement		School mean mathematics achievement variability		Interaction : Female teacher * School mean mathematics achievement variability		Interaction : Mathematics teacher * School mean mathematics achievement variability		Interaction : Female teacher * School mean mathematics achievement		Interaction : Mathematics teacher * School mean mathematics achievement	
	ß	(S.E.)	ß	(S.E.)	ß	(S.E.)	ß	(S.E.)	ß	(S.E.)	ß	(S.E.)	ß	(S.E.)	ß	(S.E.)
Australia					0.00	(0.00)			-0.00	(0.00)	-0.00	(0.00)	0.00	(0.00)	-0.00	(0.00)
Finland							0.02	(0.00)								
Latvia	0.33	(0.15)			-0.00	(0.00)	0.01	(0.00)							0.00	(0.00)
Mexico									0.01	(0.00)			0.00	(0.00)	0.00	(0.00)
Portugal													0.00	(0.00)		
Romania					-0.00	(0.00)	-0.01	(0.00)	0.01	(0.00)			0.01	(0.00)	0.00	(0.00)
Singapore	0.33	(0.15)							0.01	(0.00)					0.00	(0.00)
Spain	0.30	(0.09)							-0.00	(0.00)	-0.01	(0.00)	-0.00	(0.00)	-0.00	(0.00)

1. Cells are blank when no significant relationship was found. Significance was tested at the 5% level, controlling for teacher gender, work experience as a teacher in total and mathematics teacher.

Source: OECD, TALIS 2013 and PISA 2012 databases.