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High-Quality Teacher
Professional Development
and Classroom Teaching
Practices: Evidence from
Talis 2013

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DIRECTORATE FOR EDUCATION AND SKILLS

**HIGH-QUALITY TEACHER PROFESSIONAL DEVELOPMENT AND CLASSROOM TEACHING
PRACTICES: EVIDENCE FROM TALIS 2013**

By Fabian Barrera-Pedemonte, UCL Institute of Education

OECD Education Working Paper No. 141

This working paper has been authorised by Andreas Schleicher, Director of the Directorate for Education and Skills, OECD.

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ABSTRACT

This paper examines the contribution of high-quality teacher professional development (TPD) to the strategies teachers report using to improve students' learning in the classroom. What was taught in this TPD, and how it was delivered to teachers is compared across the 35 educational systems with available data in TALIS 2013. Results suggest that teachers who take part in curriculum-focused TPD are more likely to report using a variety of the instructional methods considered in this study. Furthermore, TPD delivered with greater levels of teacher collaboration, active learning and longer duration also increases, in many countries and economies, the likelihood of teachers reporting using a large number of these strategies. In contrast, teachers' exposure to TPD involving other teachers from the school (i.e. with collective participation) seems to be specifically detrimental for active teaching methods. The paper discusses the prevalence of these features, national gaps in their exposure and policy implications derived from these findings.

RÉSUMÉ

Cet article examine dans quelle mesure un développement professionnel de qualité (DP) peut aider les enseignants à trouver des stratégies pour améliorer l'apprentissage des élèves en classe. Dans les 35 systèmes scolaires pour lesquels les données sont disponibles dans TALIS 2013, on compare le contenu et la manière de procurer ce développement professionnel aux enseignants. Les résultats suggèrent que le DP axé sur le curriculum augmente la probabilité que les enseignants déclarent utiliser une variété de méthodes d'enseignement décrites dans cette étude. En outre, les enseignants qui déclarent avoir participé à des activités de développement professionnel mettant en œuvre un niveau élevé de collaboration entre enseignants et un apprentissage actif sur le long terme utilisent un nombre important de ces stratégies. En revanche, l'exposition des enseignants au DP impliquant d'autres enseignants de l'école (par exemple avec la participation collective) semble être particulièrement néfaste pour les méthodes pédagogiques actives. Ce document traite de la prévalence de ces caractéristiques, des lacunes nationales dans leur exposition et des implications politiques découlant de ces conclusions.

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HIGH-QUALITY TEACHER PROFESSIONAL DEVELOPMENT AND CLASSROOM TEACHING PRACTICES: EVIDENCE FROM TALIS 2013¹

Introduction

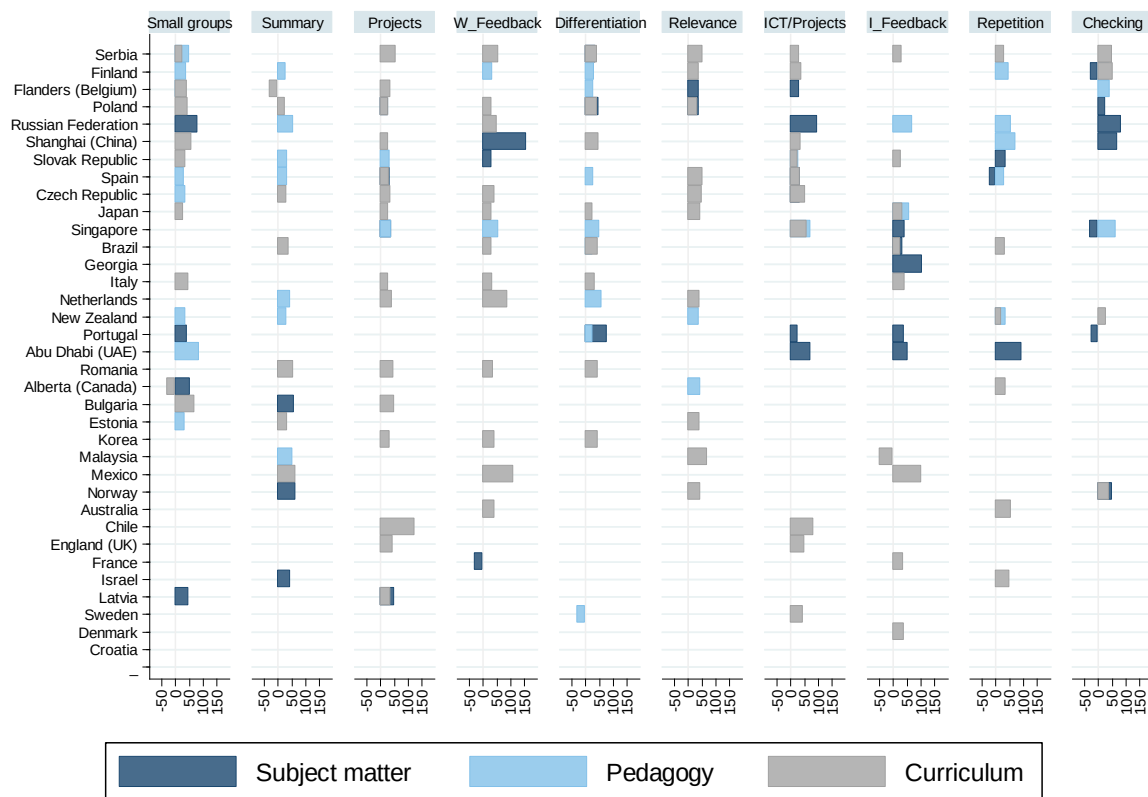
In this paper, TALIS 2013 data is used to examine whether high-quality TPD relates to reported teaching practices across countries and economies. The study addresses whether TPD focusing on subject matter, and delivered with greater degrees of collective participation, active learning, collaboration and longer duration relate to the classroom teaching practices reported by teachers.² In sum, the main question asked here is: do the features of high-quality TPD relate to classroom instruction? A school fixed-effects ordinal regression model (ORM) (Long and Freese, 2006; Winship and Mare, 1984) is used to evaluate these relationships, with background characteristics of teachers included as control variables.³

This section presents the results for 10 classroom teaching practices reported by teachers from the 35 countries and economies with available data. To facilitate interpretation, these are organised into two sub-sections. Firstly, the contribution of three foci of TPD (subject matter, pedagogy and curriculum) is examined to shed light on what is to be learned in such activities to make a difference in the classroom. Secondly, results on the features of the delivery of high-quality TPD (collaboration, collective participation, active learning and duration), as well as the corresponding overall index of effective teacher professional development, are presented to reveal the contribution of the implementation of these activities to the ways teachers report teaching their students.

What is to be learned? TPD foci and classroom practices

The focus of TPD refers to the main topic addressed on such events. This analysis selects three central areas of teacher knowledge: subject matter, pedagogical skills and the curriculum. Figure 1 shows the percentage (horizontal axis) at which the odds of more regularly using each instructional method change when teachers are more often exposed to TPD focusing on each of the three foci. Bars depict statistically significant estimates: the blue colour stands for subject matter, light blue for pedagogy and grey for curriculum-focused TPD. Countries and economies are listed on the vertical axis.

The three foci of TPD are related to teachers' reports of using several teaching practices across many countries and economies. Indeed, across jurisdictions, every instructional method examined is significantly associated with two or three of the TPD topics, while, at the same time, every country and economy (with the exception of Croatia) presents at least one significant association between a TPD focus and a reported classroom practice. Overall, these results suggest that these three areas of knowledge are relatively good cross-national indicators of the contribution of TPD to the way teachers report teaching in the classroom.

Figure 1. Relationships between classroom practices and foci of professional development activities

Countries are ranked in descending order by number of significant estimates across classroom practices.

Source: OECD (2013), *Teaching and Learning International Survey (TALIS): 2013 complete database*, http://stats.oecd.org/index.aspx?datasetcode=talis_2013%20.

However, participating in a TPD activity centred on any of these foci is not always associated with a more regular use of every classroom practice. For instance, the engagement of French teachers in subject matter-focused TPD decreases, by 31%, the odds of those teachers reporting that they provide written feedback to their students in addition to a mark.

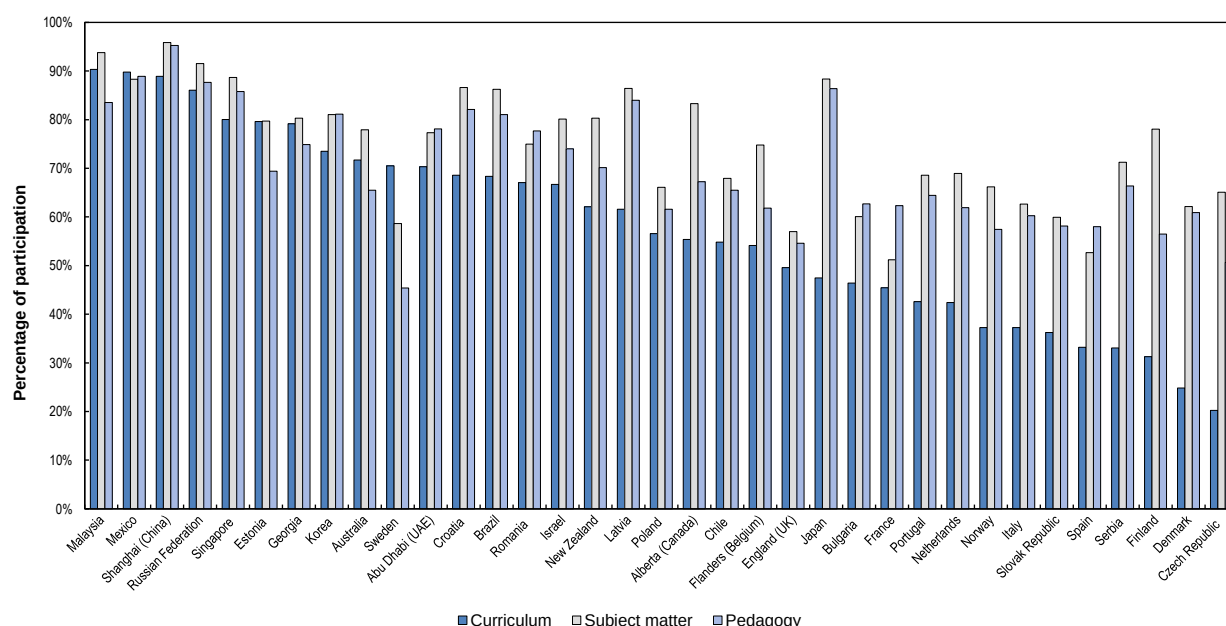
Results are specific for each country and economy. Indeed, there is important variation in reported use of a number of instructional practices with significant estimates across jurisdictions (from no association, found in Croatia, to nine observed in Serbia). In addition, countries and economies differ in terms of the set of foci that are more related to the work of their teachers. For instance, only curriculum-focused TPD is linked to reported instruction in Australia; Brazil; Chile; Denmark; England, United Kingdom; Italy; Korea; Mexico; and Romania, whereas in countries like the Russian Federation, all the three foci show significant contributions. All in all, it becomes difficult to reveal a clear pattern of association across countries and economies based on the relationships observed.

Having said this, curriculum-focused TPD is notoriously more related to the reported efforts of teachers for enhancing students' learning than the pedagogy and subject matter foci. The number of positive associations for this topic is, respectively, 2.4 and 3 times greater than for the other two foci, and, apart from the presentation of a summary of recently learned content and checking students' notebooks, it is the focus of TPD that predominantly increases the likelihood of reporting the use of each of the teaching strategies. Contrary to expectations (Desimone, 2009; Kennedy, 1998), subject matter-focused TPD is

comparatively less associated with reported instruction than curriculum-focused activities. This result highlights the global relevance of the knowledge of the curriculum as a topic to be addressed in TPD opportunities that support the work of teachers in the classroom.

Considering the relevance of curriculum-focused TPD with regard to the reported use of classroom teaching practices, the prevalence of this focus is compared with the prevalence of subject matter and pedagogy focused TPD within countries and economies. Figure 2 depicts, for each jurisdiction, the percentage of teachers who indicated that the TPD experienced over the year addressed topics related with these three foci.

Figure 2. Participation in professional development activities focused on the curriculum, subject matter and pedagogy



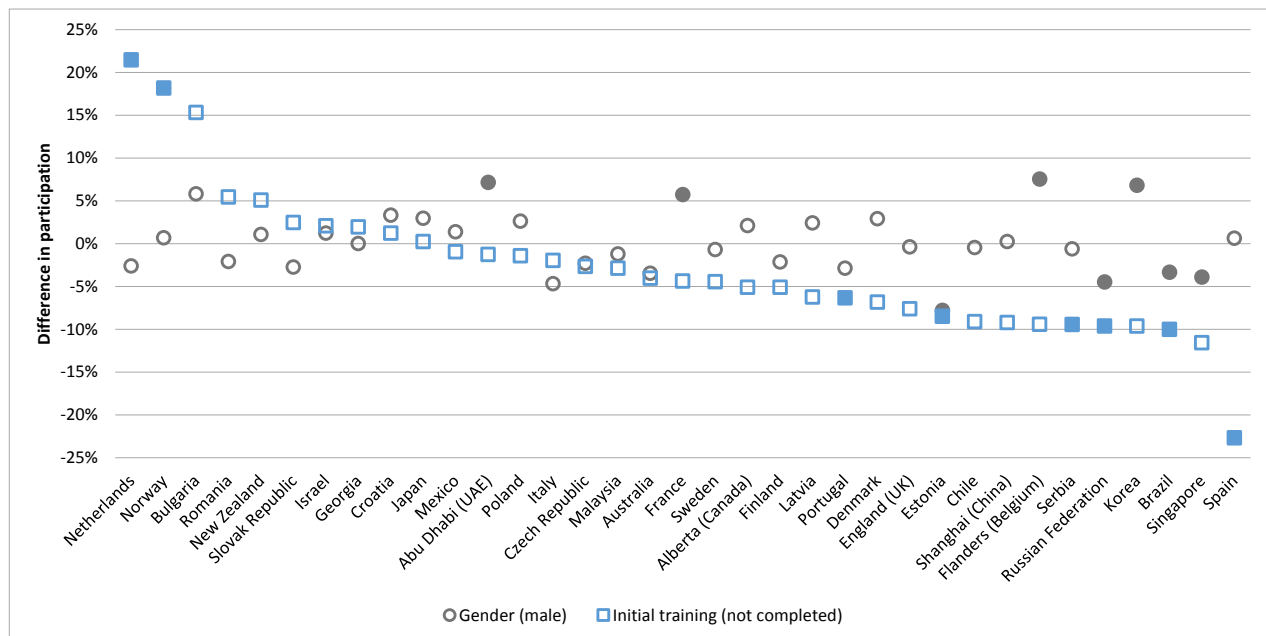
Countries are ranked in descending order by participation in curriculum-focused TPD.

Source: OECD (2013), *Teaching and Learning International Survey (TALIS): 2013 complete database*, http://stats.oecd.org/index.aspx?datasetcode=talis_2013%20.

Results show that, within each country and economy, more than half of the teachers took part in TPD that covered topics about the knowledge (subject matter) and pedagogy of their subject field(s) (with the exception of the pedagogy in Sweden). In contrast, curriculum-focused TPD is reported by a lower proportion of teachers in 14 countries and economies and it is comparatively less reported than the other two foci in 28 cases. In general, these data suggest that the topic of TPD that is more predominantly related with reported instruction – e.g. curriculum – is the focus to which teachers are least exposed to.

Furthermore, there are gaps within a number of countries and economies in the exposure to curriculum-focused TPD. Figure 3 illustrates the difference in the percentage of teachers, by gender, who took part in this kind of TPD and whether they completed a phase of initial teacher education. Circles indicate the proportion of male over female teachers, and squares the proportion of teachers with uncompleted over completed initial training. Filled markers depict statistically significant gaps.

Figure 3. Difference in teachers' participation in curriculum-focused professional development activities, by gender and completion of initial training



Countries are ranked in descending order by the size of estimates related with the completion of initial training.

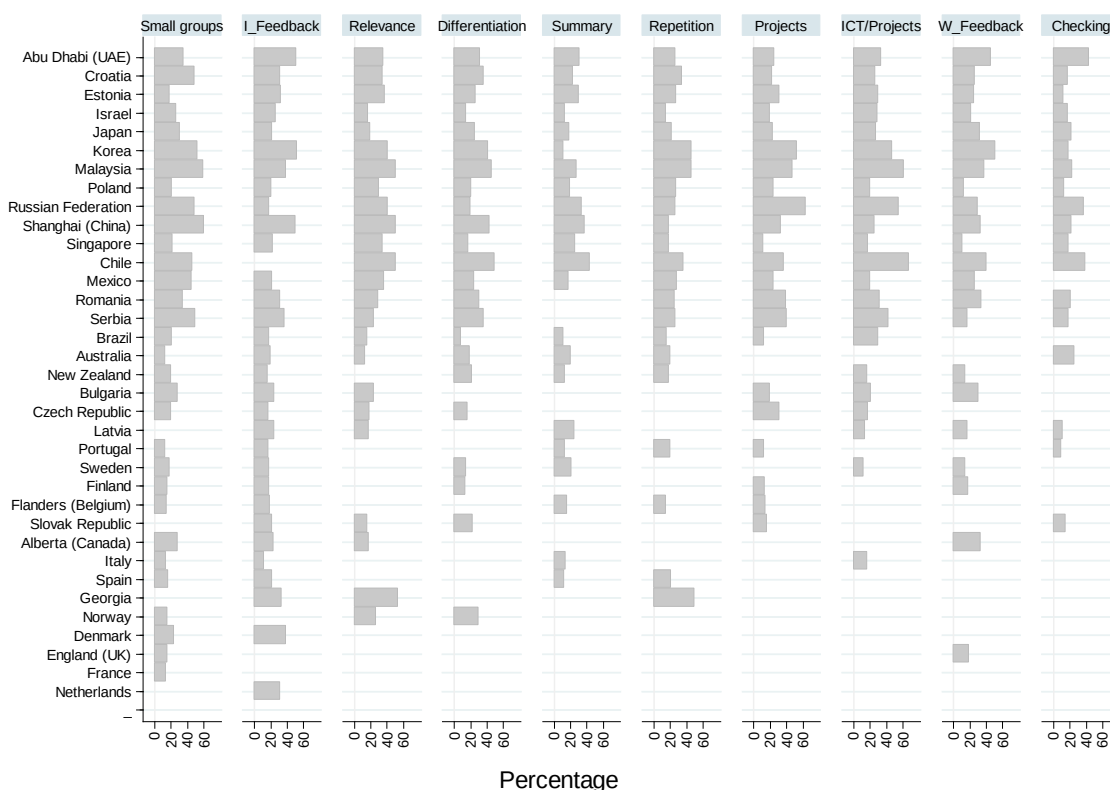
Source: OECD (2013), *Teaching and Learning International Survey (TALIS): 2013 complete database*, http://stats.oecd.org/index.aspx?datasetcode=talis_2013%20.

According to these data, male teachers participate significantly more in curriculum-focused TPD than their female colleagues in Abu Dhabi, United Arab Emirates (7%); France (6%); Flanders, Belgium (8%); and Korea (7%), whereas the opposite is observed in Brazil (-3%), Estonia (-8%), the Russian Federation (-4%), and Singapore (-4%). Regarding the completion of initial teacher training, teachers from the Netherlands (21%) and Norway (18%) working without such qualifications were more engaged in curriculum-focused TPD, but they were significantly less exposed in Brazil (-10%), Estonia (-9%), Portugal (-6%), the Russian Federation (-10%), Serbia (-9%) and Spain (-23%).

How is it delivered? TPD implementation and classroom practices

The second group of predictors included in the analyses refer to the features of the delivery of high-quality TPD, namely: collective participation, collaboration, active learning and extended duration. A complex factor score based on teachers' responses to all these four items was included in the TALIS 2013 international database, which is used here as an overall indicator of high-quality TPD. These measures were expected to be directly associated with the teaching strategies reported by teachers across countries and economies.

Figure 4 illustrates the change in the odds of reporting the use of each teaching strategy (horizontal axis) with a higher level of frequency that is associated with one standard deviation increase in the exposure of teachers to this kind of TPD. Bars indicate the size of the associations in terms of percentage, whereas countries and economies are listed on the vertical axis according to the number of significant estimates across classroom practices.

Figure 4. Relationships between classroom practices and high-quality professional development activities

Countries are ranked in descending order by number of significant estimates across classroom practices.

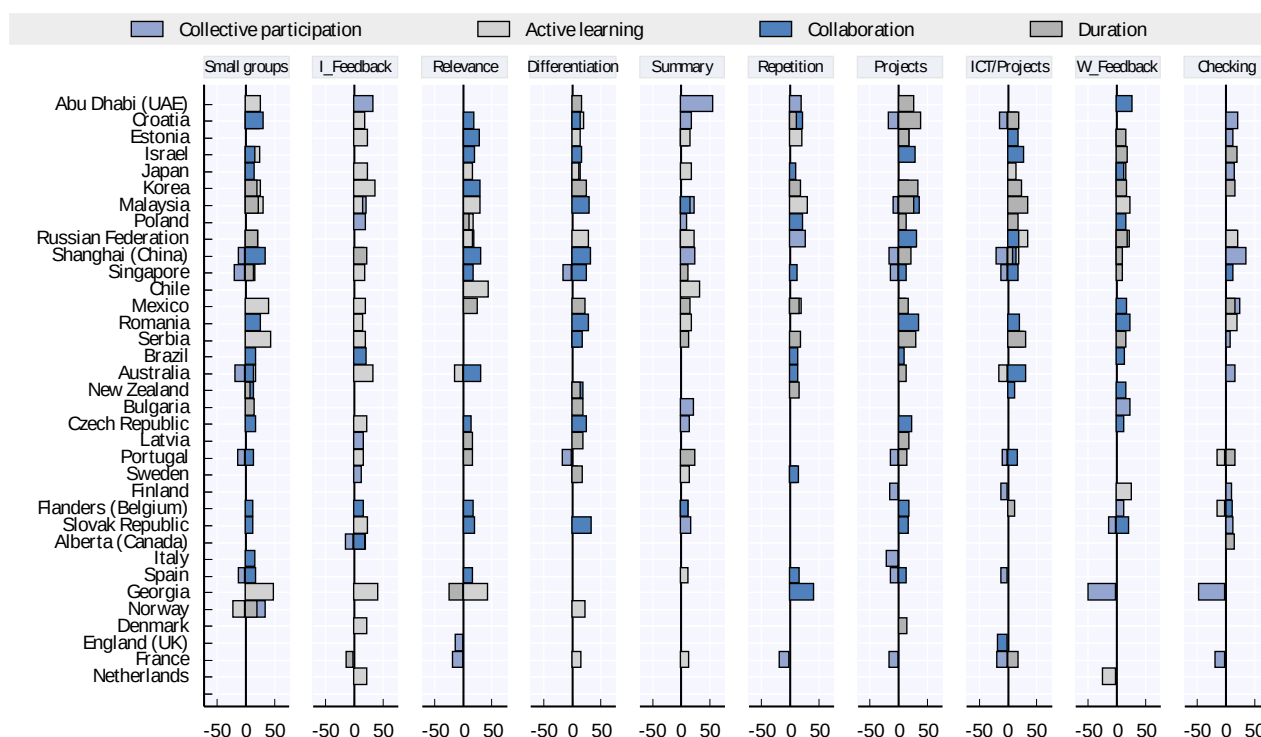
Source: OECD (2013), *Teaching and Learning International Survey (TALIS): 2013 complete database*, http://stats.oecd.org/index.aspx?datasetcode=talis_2013%20.

The analysis shows that teacher participation in high-quality TPD is globally related to the methods reportedly carried out by teachers to promote student learning. In Abu Dhabi, United Arab Emirates; Croatia; Estonia; Israel; Japan; Korea; Malaysia; Poland; the Russian Federation; Shanghai, China; and Singapore, all the teaching strategies are significantly related to this factor and, in 13 countries and economies, more than half of these outcomes produce consistent associations.

Whilst high-quality TPD is significantly linked with at least one teaching method across all countries and economies, it is worth highlighting that all the associations reveal a positive direction. Thus, the higher the exposure of teachers to high-quality TPD, the greater the chances they report using a greater variety of strategies to teach their students. To give an example, if a Danish teacher increases his or her participation in high-quality TPD by one standard deviation, his or her odds of organising students in small groups for co-operative learning and for observing them to give them immediate feedback would increase by 24% and 39%, respectively.

A more detailed analysis is presented in Figure 5 to examine the individual contribution of each feature of high-quality TPD to the classroom practices considered. As in the previous analysis, bars represent the percentage of change in the odds of reporting the implementation of each method with a higher frequency that is associated with one standard deviation increase in the exposure of teachers to each TPD feature (while the individual contribution of the rest of features is held constant).

Figure 5. Relationships between classroom practices and features of high-quality teacher professional development



Countries are ranked in descendent order by number of significant estimates across classroom practices.

Source: OECD (2013), *Teaching and Learning International Survey (TALIS): 2013 complete database*, http://stats.oecd.org/index.aspx?datasetcode=talis_2013%20.

From a cross-national perspective, it can be clearly seen that all these measures are sufficiently sensitive to detect differences in the odds of reporting the implementation of the teaching methods analysed. Overall, the associations also reveal a positive direction for these links. However, two key aspects emerge particularly from this analysis.

Firstly, it must be noted that some of these features might be detrimental for the reported use of a number of instructional strategies in specific countries and economies. For example, TPD implemented with greater degrees of collective participation is particularly unfavourable to reports of having students work on projects that require at least one week to complete, organising them into small groups for co-operative learning and encouraging them to use ICT (information and communication technology) for such tasks.

As an illustration, one standard deviation increase in the participation of Croatian teachers in TPD that involve groups of colleagues from the same school – i.e. collective participation – decreases, by 18%, the likelihood of reports of having students work on project-based learning. In this regard, it is worth noting that this kind of TPD is specifically detrimental to the three strategies that were characterised as active practices in the OECD international report (OECD, 2014): having students work in small groups, assigning one-week long projects to students and using ICT.

Given that TPD delivered with greater levels of active learning and longer duration also yields negative associations on the reported use of some teaching practices in a number of jurisdictions, it is worth highlighting that only collaborative TPD consistently produces positive estimates across all its

significant associations. This aspect is particularly revealing for this analysis because it strongly supports the eligibility of this dimension as a feature of high-quality TPD. In addition, it highlights the contrast with collective participation. In other words, while TPD delivered to teachers from the same school is unfavourable for using active practices, collaborative TPD is always positively associated with all the teaching methods examined.

Secondly, on occasion, the combination of all four dimensions can make a difference in the classroom, even though their individual contribution may not do so on its own. An exemplary case is the positive relationship observed in Abu Dhabi (United Arab Emirates) between the factor score of high-quality TPD (Figure 4) and the practice of referring to a problem from everyday life or work to demonstrate the usefulness of the knowledge taught (i.e. relevance). In this case, none of the individual four features of high-quality TPD produces a significant association with such a strategy (Figure 5). This finding suggests that, for some countries and economies, high-quality TPD is not a particular an isolated attribute, but a combination of several enabling features that matters for enhancing teachers' practices.

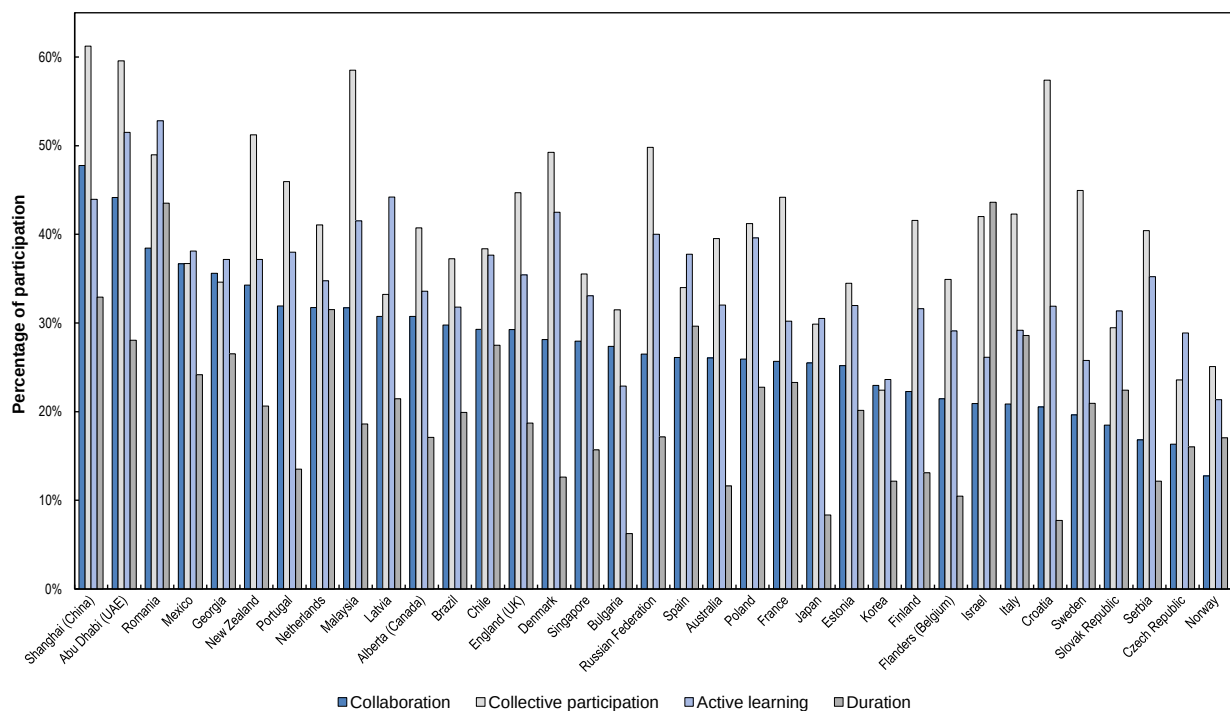
On the other hand, while the results from the overall index appear unrelated to the outcomes in some countries, it is still useful to explore whether specific features make a consistent contribution. For instance, although an increase in the exposure of Finnish teachers to the overall measure of high-quality TPD is likely to have a null change in the odds of reports of providing students with written feedback in addition to a mark, their participation in TPD with greater levels of active learning, in particular, did lead to change. Indeed, if a teacher from this country increases, by one standard deviation, his or her exposure to more active experiences of TPD, his or her odds of providing this feedback to students would increase by 27%.

All in all, these results underline the cross-national importance of the indicators of high-quality TPD for the strategies reportedly implemented by teachers to promote learning gains in their students. Despite this relevance and considering the high participation in TPD across countries and economies, it is striking to note that most of the learning activities that teachers attend feature low levels of quality, as measured by the four indicators used in this analysis. Figure 6 illustrates the percentage of teachers who indicate that most, or all of the TPD experiences they participated over the year included collective participation, collaboration, active learning and extended duration.

According to these data, less than a half of teachers across most countries and economies indicate that most or all of their TPD includes these four attributes. Excepting collective participation in Abu Dhabi, United Arab Emirates (60%); Croatia (57%); Malaysia (59%); New Zealand (51%); and Shanghai, China (61%), and active learning in Abu Dhabi, United Arab Emirates (51%) and Romania (53%), all the features show rates smaller than 50%. In general terms, these results indicate that teachers experience a limited number of opportunities of high-quality TPD.

Furthermore, it is striking that, in the majority of countries and economies, collective participation is the feature with the highest rate, whereas collaboration is comparatively less frequently reported. This aspect reveals a considerable imbalance between these two features within an important number of jurisdictions. Since the previous analysis showed that TPD with collective participation can be detrimental for the reported use of active and student orientated teaching practices, this imbalance is, to some extent, problematic. In other words, teachers are receiving more TPD that can be counterproductive to their work than TPD based on collaboration, which is the feature that consistently supports instruction.

Figure 6. Teachers' participation in professional development activities delivered with collective participation, collaboration, active learning and extended duration



Countries are ranked in ascending order by participation in TPD with longer duration.

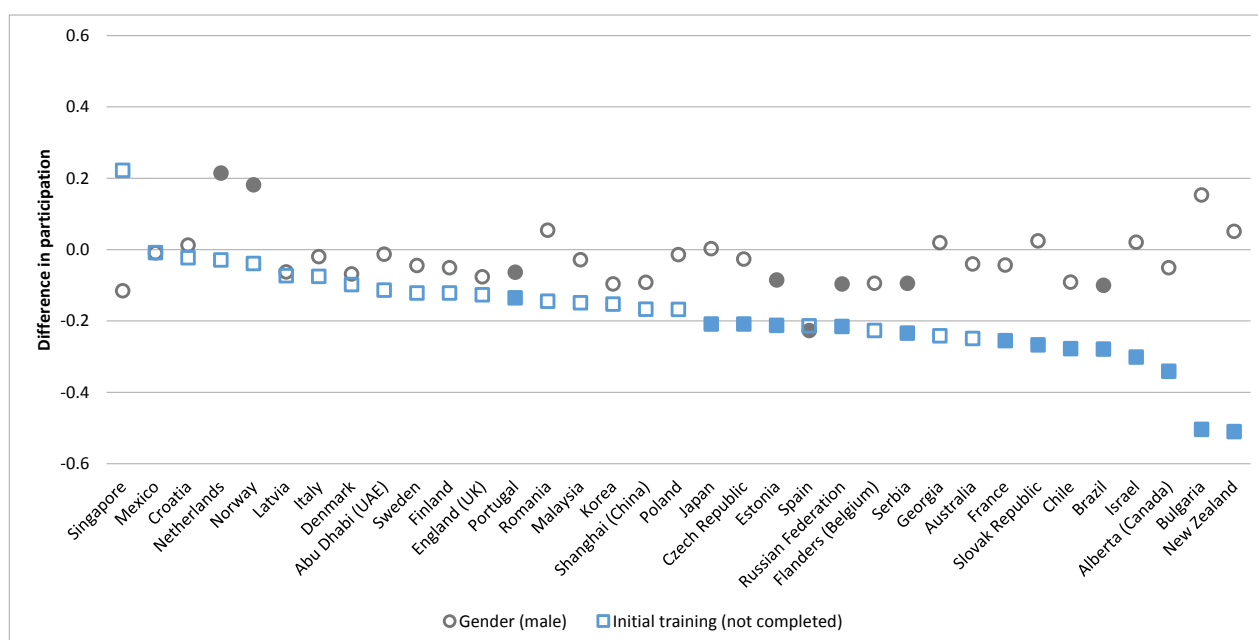
Source: OECD (2013), *Teaching and Learning International Survey (TALIS): 2013 complete database*, http://stats.oecd.org/index.aspx?datasetcode=talis_2013%20.

Finally, gaps were also found in the exposure to high-quality TPD in some countries and economies with regard to teachers' gender and completion of initial training. Figure 7 details the differences in the mean value of the index of effective professional development; circles illustrate the difference between male and female teachers, whereas squares show the difference between teachers with and without initial training. Filled markers are used to spot statistically significant differences in the exposure to high-quality TPD.

These data reveal that male teachers from the Netherlands (0.21) and Norway (0.18) are significantly more exposed to high-quality TPD than their female counterparts, whereas the opposite is true for colleagues in Brazil (-0.10), Estonia (-0.09), Portugal (-0.06), the Russian Federation (-0.10), Serbia (-0.09) and Spain (-0.23). Regarding the completion of the phase of initial training, it is striking that significant gaps are always unfavourable for teachers without such qualifications. This is the case in Alberta, Canada (-0.34); Brazil (-0.28); Bulgaria (-0.50); Chile (-0.28); the Czech Republic (-0.21); Estonia (-0.21); France (-0.26); Israel (-0.30); Japan (-0.21); New Zealand (-0.51); Portugal (-0.14); the Russian Federation (-0.22); Serbia (-0.23); and the Slovak Republic (-0.27).

This finding is particularly worrying because it indicates that, in practically half of the countries and economies, teachers who lack full experience in pre-service training receive TPD opportunities of a lower quality, compared to qualified colleagues.

Figure 7. Difference in teachers' participation in high-quality professional development activities, by gender and completion of initial training



Countries are ranked in descendent order by the size of estimates related with the completion of initial training.

Source: OECD (2013), *Teaching and Learning International Survey (TALIS): 2013 complete database*, http://stats.oecd.org/index.aspx?datasetcode=talis_2013%20.

The following section summarises the main findings presented in this section and includes a number of policy implications derived from these analyses.

Summary and main implications

This paper uses data from the Teaching and Learning International Survey (TALIS) 2013 to examine the contribution of high-quality TPD to the practices teachers report using to improve students' learning in 35 countries and economies. In order to modify and improve teaching practices, providing opportunities for professional development is crucial, but not sufficient. Previous studies have shown that certain features of professional development are more likely to improve teaching practices than others.⁴

High-quality TPD is defined here as a combination of features of in-service training identified by empirical research as positively associated with better educational outcomes (see Annex 1). To facilitate the interpretation of results, a distinction was made between features related to the main content of TPD activities (subject matter, pedagogy and curriculum) and their delivery to teachers (collaboration, collective participation, active learning and duration). The association between these explanatory variables and ten reported classroom practices was then estimated to shed light on the relative importance of these features to support the work of teachers. Furthermore, the prevalence of these dimensions and gaps in teachers' exposure by gender and completion of initial training were explored within each TALIS country and economy.

High-quality TPD is globally associated with teaching practices

One of the main findings of this research indicates that high-quality TPD is widely associated with the likelihood of reporting a variety of teaching methods across a considerable number of countries and economies. In general, these results suggest that the higher the exposure of teachers to high-quality TPD, the greater the chances are that they report using a wide variety of methods in the classroom.

However, some features of high-quality TPD are more important than others for predicting differences in reported instruction. Regarding the features related to the focus of TPD (what is to be learned in these activities), curriculum-focused TPD is clearly more related to reported classroom practices than the pedagogy and subject matter foci. And among the features related to the delivery of TPD (collaboration, collective participation, active learning and duration), only collaboration systematically produces positive estimates across all the reported teaching methods.

The link between curriculum-focused TPD and the work of teachers in the classroom is stronger

Contrary to expectations, curriculum-focused TPD is associated with reported instruction in more countries and economies than subject matter-focused TPD. As mentioned, previous research suggested that TPD that mainly addresses subject knowledge (e.g. mathematics, science, literacy, etc.) was strongly related to better classroom practices (Desimone, 2009; Kennedy, 1998). However, this paper shows that the contribution of curriculum-focused TPD is observed three times more across jurisdictions than that of subject matter-focused TPD and it is the content of TPD that consistently increases the chances of reporting the use of the majority of the teaching strategies examined.

Although curriculum and subject matter-focused TPD have similarities in relation to the disciplinary knowledge taught to teachers, curriculum-focused TPD also emphasises the practical aspects underlying the way such content can be taught. In other words, the main difference of curriculum-focused TPD is that it includes knowledge on how to organise the delivery of subject matter to the students. A similar difference can be observed with pedagogy-focused TPD. This type of training has an emphasis on practical strategies through its connection with subject or curriculum knowledge. In that sense, curriculum-focused TPD provides a good balance between content and practice knowledge. Hence, the global association of this focus with the reported practices of teachers may reflect the close link between the guidelines to plan, develop and assess lessons that are generally contained in the curricular frameworks. Whilst subject matter-focused TPD is important to enrich instruction in some countries and economies, this finding underlines the global relevance of addressing curricular aspects of TPD programmes that aim to make a difference in the classroom.

The greater the collaboration in TPD, the better the practices in the classroom

Collaboration is the only feature of the delivery of high-quality TPD that always increases the likelihood of reporting the use of the teaching methods considered. Although collective participation, active learning and duration predict significant changes in reported instruction, such changes are, on occasion, detrimental in specific countries and economies. In this context, it is interesting that TPD activities in which teachers receive more encouragement to share and support their learning processes (i.e. collaboration) always increase the chances of using a variety of teaching strategies, as reported by teachers.

This finding underlines that grouping teachers from the same school (i.e. collective participation) is not enough to make a difference in the classroom. Indeed, this paper demonstrates that such a feature of the delivery of TPD is particularly counterproductive for the reported implementation of active teaching practices. Having students work on projects that require at least one week to complete, organising them into small groups for co-operative learning and encouraging them to use ICT (information and

communication technology) for projects are strategies less likely to be reported by teachers that engage more in TPD with colleagues from the same school. This finding may suggest that the implementation of such active teaching practices, which involve longer term efforts to promote students' learning, is hindered by the absence of teachers while they attend in-service training events. In contrast, teachers who participate in collaborative learning activities or research with other teachers report greater use of all the teaching methods analysed, including the aforementioned active and student orientated practices.

Critical imbalances and equity concerns in teachers' exposure to high-quality TPD

Considering the relevance of curriculum-focused TPD and collaboration as key features of high-quality TPD, it is worrying to note the relative imbalance between these features and those that are less likely to be associated with the reported work of teachers in the classroom. On the one hand, the focus of TPD that is more related to reported instruction – e.g. curriculum – is the focus to which teachers are least exposed in almost all the countries and economies. On the other hand, collaboration is comparatively less experienced by teachers in practically all the TALIS jurisdictions, while collective participation is generally the more frequent feature of TPD.

Furthermore, this paper reveals significant gaps within a number of countries and economies in the exposure to curriculum-focused and high-quality TPD (as measured by the overall index of effective professional development). With regard to teachers' gender, in some jurisdictions, male teachers are more likely to engage in TPD with these characteristics and less likely than their female colleagues in others. Nevertheless, it is worth noting that the exposure to curriculum-focused and high-quality TPD is always unfavourable for female teachers in Brazil, Estonia, and the Russian Federation. In addition, teachers who have not completed initial training are also less exposed to curriculum-focused and high-quality TPD in these three countries (and in Portugal) than their qualified colleagues.

Policy implications

This paper shows that the features of high-quality TPD are good global indicators that contribute to the practices reported by teachers to improve students' learning in the classroom. In particular, curriculum-focused TPD and collaboration represent the features that are more closely related to differences in the work of teachers. Critical issues to take into account are the imbalance between these features and other dimensions less related to reported instruction across countries and economies, and the potential set of barriers to accessing high-quality TPD within jurisdictions. This paper suggests the following policies for consideration:

- encouraging teachers' engagement in curriculum-focused TPD, as well as in TPD featured by collaborative learning activities or research with other teachers
- developing strategies to monitor the quality of the TPD delivered to teachers, considering national standards and assurance procedures
- preventing barriers to accessing high-quality TPD related to teachers' gender or other relevant variables identified at the national or local level (e.g. ethnicity, types of schools, etc.)
- ensuring that teachers who have not completed initial training are exposed to high-quality TPD.

The underlying principle behind all these recommendations is that teacher professional development needs to have a support structure. As results from TALIS 2013 have shown, teachers across several educational systems face significant barriers to accessing professional development (TALIS, 2014a). Furthermore, this paper has shown that there may be characteristics – such as gender and completion of

initial training – that could be affecting their involvement in these types of initiatives. Thus, there needs to be a structure of support coming from school leadership, the districts and national policies that enables teachers to improve their practices.

NOTES

- 1 . The paper presents the results of a study conducted by Fabian Barrera-Pedemonte as a fellow in the OECD's Thomas J. Alexander Fellowship Programme, in which he was mentored by Noémie Le Donné and Pablo Fraser, analysts in the Directorate for Education and Skills. For more information about the Thomas J. Alexander Fellowship programme, please go to www.oecd.org/edu/thomasjalexanderfellowship.htm.
- 2 . For a more detailed discussion on the features of high-quality teacher professional development, please see Annex 1.
- 3 . For details on the methodological strategy, please see Annex 2.
- 4 . An important limitation of the present study is that student outcomes are not included. Thus, the assessment of whether the different features of professional development improve the “effectiveness” of teaching practices is limited to the fact that is not possible to observe the association of these practices with student outcomes.

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ANNEX 1. THE FEATURES OF HIGH-QUALITY TEACHER PROFESSIONAL DEVELOPMENT

In recent decades, a policy debate about teachers' professional development (TPD) has been promoted in developed countries due to the implementation of lifelong learning policies (Day, 1999; OECD, 1998a). The teaching profession has been recognised as a model to other professional sectors in order to accomplish the aspiration of universal and permanent learning opportunities for individuals within societies. High-quality teachers are necessary to ensure effective access to knowledge through national school systems. Consequently, in order to be "high-quality" in an ever-changing context of globalisation, teachers need regular opportunities to develop their competencies.

A number of policy documents developed by the Organisation for Economic Co-operation and Development (OECD) have indicated that initial teacher education is not sufficient to prepare teachers for all the challenges of their careers in the context of a global, changing society (OECD, 1998b; Coolahan, 2002; Musset, 2010; OECD, 2005; Stewart, 2011). Therefore, countries and economies have been encouraged to offer in-service training for their teachers on the assumption that the greater this provision, the more positive the influence on educational outcomes.

Accordingly, most teachers in developed countries and emerging economies are now expected to engage in activities of professional development. In fact, in many nations, the participation in continuing training has become a compulsory requirement to maintain employment, as well as a necessary component to obtain promotion and salary upgrades (European Commission/EACEA/Eurydice, 2013; OECD, 2012). According to data from recent international teacher surveys, more than 86% of teachers attend TPD activities every year (Mullis et al., 2012; OECD, 2009; OECD, 2014).

Nevertheless, recent literature has demonstrated that not all TPD is effective, but some measurable dimensions of the quality of such experiences can explain positive effects in specific contexts (Caena, 2011; Timperley et al., 2007). Large-scale empirical research carried out in the United States (Garet et al., 2001), Australia (Ingvarson, Meiers and Beavis, 2005) and England (Opfer and Pedder, 2011) has suggested that TPD focused on subject matter knowledge, and delivered with a greater degree of coherence, collective participation, active learning, and longer duration, is consistently associated with better educational outcomes. TPD carried out with such characteristics is thought to play a major role in facilitating teacher learning, and is likely to influence the way teachers promote students' learning in the classroom (DeMonte, 2013; Desimone, 2009; Garet et al., 2001). Box 1 briefly describes all these dimensions, which are considered in this paper as attributes of high-quality TPD.

As the application of TPD programmes with these qualities can involve significant costs for educational systems, it becomes crucial to determine whether they are related – and to what extent – to differences in teacher learning across several countries and economies. If it can be shown that high-quality TPD is globally associated with the efforts of teachers to improve students' learning, then educational policy should also warrant equal access to such activities for the entire teacher workforce. Therefore, the design of in-service training can be effectively refined at the national level, whereas guidelines and standards for high-quality teacher learning and the corresponding assurance procedures can be fairly contextualised.

A cross-national analysis on the contribution of high-quality TPD to teaching practices is, nowadays, possible, given the availability of information produced by a number of international large-scale assessments. My review of the most recently accessible data revealed that variables that describe most of

the aforementioned indicators can be adequately taken from the information reported by lower secondary teachers in the 2013 Teaching and Learning International Survey (TALIS) (OECD, 2014).

Box 1. The features of high-quality teacher professional development

Based on the consistency between empirical findings and other strands of research in the area of TPD, Desimone (2009) identified this set of five core features as characterising high-quality TPD. What follows is a brief description of each domain:

- **Content focus:** Instead of focusing on generic behaviours for teaching, effective TPD programmes mainly focus their content on subject matter knowledge (e.g. mathematics, science, literacy, etc.).
- **Collective participation:** This feature refers to the necessary interaction of groups of teachers from the same school to develop meaningful learning amongst peers.
- **Active learning:** Effective TPD programmes provide opportunities oriented to observe, design, perform or expose teaching practices, as a manner to engage teachers in inquiry-based learning experiences.
- **Duration:** Although research has not yet defined a specific time span, it is argued that longer term TPD programmes are more effective, both with regard to the overall amount of time that the activity takes and the total amount of hours spent.
- **Coherence:** Effective TPD programmes are logically aligned to the goals of the educational policies that support them, as well as to the knowledge and beliefs of teachers.

Source: Desimone, L. M. (2009), "Improving impact studies of teachers' professional development: toward better conceptualizations and measures", *Educational Researcher*, Vol. 38/3, pp. 181-199.

In this regard, it is worth mentioning that the two cycles of the TALIS programme (OECD, 2009; OECD, 2014) have facilitated significant strides in understanding how TPD and instruction are associated. For example, several analyses derived from both cycles (Hendriks et al., 2010; OECD, 2013a; OECD, 2014; OECD, 2015) have demonstrated that traditional forms of TPD (e.g. workshops, seminars, etc.) are still more prevalent across countries and economies than innovative designs (e.g. teachers' networks, mentoring, etc.). Further, they have shown that, in the majority of the countries and economies assessed, such innovative forms of TPD are significantly associated with teachers' reported use of specific teaching practices¹ (OECD, 2009; OECD, 2013a; OECD, 2014; Vieluf et al., 2012). In addition, recent analyses of the 2013 cycle of the survey (OECD, 2015; Opfer, 2016) have revealed that job-embedded TPD has a stronger association with the self-efficacy of teachers than non-job embedded TPD, which would suggest that school-based forms of TPD may be more effective in supporting the quality of teaching.

However, the majority of these studies have operationalised TPD in terms of the types of activity attended by teachers (workshops, seminars, teachers' networks, etc.), thus, few analyses focus on the topics they address and how they are delivered. This is somewhat problematic because the dimensions of high-quality TPD (Box 1) have remained unexplored in this unique source of information. In particular, their contribution to teaching practices has not been sufficiently examined, even though such features are empirically well-established, as well as relevant and malleable for policy makers (Rutkowski et al., 2013).

The 2013 cycle of TALIS attempted to redress this gap and gathered information about most of the features of high-quality TPD listed in Box 1.² This opens interesting opportunities to statistically analyse whether such measures are related to teachers reported practices in the classroom in a considerable number

of countries and economies. In addition, it allows for the evaluation of the eligibility of an additional feature – e.g. collaboration³ – which has also been suggested by research as one of the components of high-quality TPD. Furthermore, relevant variables included in TALIS 2013 allow for an examination of the access to high-quality TPD activities among teachers from the jurisdictions included in this study.

This study provides statistical evidence to compare, across countries and economies, the contribution of the key components of the quality of TPD to the strategies teachers report undertaking to enhance students' learning in the classroom. Estimates of the association between specific instructional methods and each of these dimensions across all the 35 participating countries and economies with available data⁴ are presented in detail and discussed.

NOTES

- 1 . To illustrate, in approximately half of the countries and economies assessed in TALIS 2013, teachers that participated in individual or collaborative research activities were: (a) 27% to 88% more likely to report implementing project-based learning; and (b) 23% to 98% more likely to report using ICT in the classroom (OECD, 2014).
- 2 . Unfortunately, TALIS 2013 did not include data about the coherence of TPD activities experienced by teachers.
- 3 . Collaboration refers to TPD programmes in which groups of teachers are encouraged to actively share and support their learning processes during in-service training. The three systematic reviews developed by Cordingley et al. (2003, 2005a, 2005b) revealed that this feature is consistently linked to improvements in teaching and learning outcomes. Unlike the feature “collective participation”, where only the participation of teachers from the same school is required, collaborative TPD programmes underline the importance of exchanging experiences and reflection from practices developed by colleagues, including those working in different schools.
- 4 . Data from Cyprus* and Iceland are not analysed in this paper because they are not available in the public TALIS 2013 international database. The data from the United States is not included in this report because it did not meet the international standards for participation rates.

* Note by Turkey: The information in this document with reference to “Cyprus” relates to the southern part of the Island. There is no single authority representing both Turkish and Greek Cypriot people on the Island. Turkey recognises the Turkish Republic of Northern Cyprus (TRNC). Until a lasting and equitable solution is found within the context of the United Nations, Turkey shall preserve its position concerning the “Cyprus issue”.

Note by all the European Union Member States of the OECD and the European Union: The Republic of Cyprus is recognised by all members of the United Nations with the exception of Turkey. The information in this document relates to the area under the effective control of the Government of the Republic of Cyprus.

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ANNEX 2. METHODOLOGICAL STRATEGY

Data sources

Survey design and participants. TALIS is a programme of surveys that collects information on teachers and school leaders from the educational systems of the OECD country members and its partner economies (OECD, 2010; Rutkowski et al., 2013). The main international target population of TALIS are classroom teachers employed in lower secondary education (e.g. ISCED¹ 2).²

In order to collect representative data from the national target populations, TALIS implements a two-stage stratified sampling procedure: in the first stage, a minimum of 200 schools are selected from each national frame by systematic random sampling with probability proportional to size; in the second stage, a minimum of 20 teachers are randomly selected within each school. In TALIS 2013, teachers and head-teachers (principals) from 38 countries and economies took part in the survey (OECD, 2014a).

TALIS organisers set minimum standards of participation for the sampled schools (75%) and teachers within them (75%) to preserve the desired representation of the target populations. Countries and economies with response rates below the standard are allowed to improve these numbers by substituting with replacement schools, which correspond to the next school in the national lists of eligible units. In TALIS 2013, the response rates across jurisdictions were satisfactorily accomplished after replacement. Only schools in the United States (US) were the exception (62%). For this reason, US estimates were excluded from calculations of international averages in the analyses of the official reports.

Sampling weights are calculated in each round by the organisers in order to correct for the unit non-response at the teacher and school levels, thereby a specific weighting factor (Rust, 2013) informing the probability of selection and adjustments for nonparticipation is assigned to each school and teacher. By applying these inverse probability weights to the variables of interest, estimates are adjusted to be representative of the national target populations (OECD, 2014a). Accordingly, these weighting factors were used in every analysis in this paper.

Experienced teachers (i.e. teachers with more than one year of teaching experience) who attended at least one TPD activity during the 12 months previous to the survey were the population of interest of this paper.³ The rationale for restricting the analyses to experienced teachers was that, in many countries and economies, teachers in their first year of work generally participate in induction programmes. Such programmes are specifically designed for novice teachers and so they are not fully comparable with the TPD undertaken by the rest of the staff.

Although this decision may introduce sample selection bias in the model – which also may differ by countries and economies given different rates of participation in TPD – TALIS data (OECD, 2014a: Table 4.6) revealed that teachers' engagement in TPD activities tends to be practically universal. The country with the lowest participation rate was Chile (72%), whereas in Alberta, Canada; Australia; Croatia; Latvia; Malaysia; Mexico; and Singapore, practically all teachers were engaged in TPD in the 12 months prior to the survey. In addition, novice teachers represent only 1.2% of the total sample. Hence, most of the teachers in the original national samples are included in the analysis. The total sample achieved contains 102 866 teachers across 35 countries and economies.

Classroom teaching practices. Teachers' practices were deemed by the participant countries and economies of TALIS as the second most important theme to be explored in the 2013 round out of the twenty policy areas suggested by the *TALIS 2013 Technical Report* (OECD, 2014b). Consequently, the teacher questionnaire of the study included specific items about several instructional methods that teachers

could use in the classroom. The OECD considered such practices positive aspects that promote students' learning; thus, the more often teachers participated in many of them, the better the quality of teaching.

Teachers were firstly requested to identify a specific class from their work schedule and then report their teaching practices over the year with that group of students. This paper examines as outcome variables teachers' reports of the frequency with which they put into practice a selection of these teaching and assessment practices. The teaching strategies are drawn from the following ten items (International Project Consortium, 2013):⁴

- Item 1. I present a summary of recently learned content [Summary].
- Item 2. Students work in small groups to come up with a joint solution to a problem or task [Small groups].
- Item 3. I give different work to the students who have difficulties learning and/or to those who can advance faster [Differentiation].
- Item 4. I refer to a problem from everyday life or work to demonstrate why new knowledge is useful [Relevance].
- Item 5. I let students practice similar tasks until I know that every student has understood the subject matter [Repetition].
- Item 6. I check my students' exercise books or homework [Checking].
- Item 7. Students work on projects that require at least one week to complete [Projects].
- Item 8. Students use ICT (information and communication technology) for project or class work [ICT/Projects].
- Item 9. I provide written feedback on student work in addition to a mark [W_Feedback].
- Item 10. I observe students when working on particular tasks and provide immediate feedback [I_Feedback].⁵

Key explanatory variables. Data on the “features of high-quality TPD” are also drawn from the teacher questionnaire. Among the questions used to collect information about recent experiences of TPD, the participants were asked to indicate the extent to which some characteristics of this provision were present during these events. For the ease of interpretation of the analyses, a distinction was explicitly made between features related to what was to be learned in TPD activities (focus) and those related to the way it was delivered to the staff (collaboration, collective participation, active learning and duration) (Loucks-Horsley and Matsumoto, 1999).

TPD content

Regarding the contribution of the content addressed in the TPD, the association between the exposure to subject matter-focused activities and the reported use of instructional practices is examined (Desimone, 2009; Kennedy, 1998). In addition, participation in both pedagogy and curriculum-focused TPD is also included in order to explore the potential of these alternative foci across countries and economies (Shulman, 1986; Wayne et al., 2008). The data about these three foci of TPD were taken from the following question of the teacher questionnaire (International Project Consortium, 2013):

- Did the professional development activities you participated in during the last 12 months cover the following topics?
 - Item 1. Knowledge and understanding of my subject field(s) [Subject matter].
 - Item 2. Pedagogical competencies in teaching my subject field(s) [Pedagogy].
 - Item 3. Knowledge of the curriculum⁶ [Curriculum].

TPD delivery features

Regarding the features that describe the delivery of high-quality TPD, variables about the frequency with which such activities included collective participation, active learning, longer duration and collaboration are used in the analysis. In order to account for the different distribution observed in each country, data were standardised to have a mean of zero and a standard deviation of one. What follows is the question utilised to collect data about these aspects in the TALIS 2013 teacher questionnaire (International Project Consortium, 2013):

- Considering the professional development activities you took part in during the last 12 months, to what extent have they included the following?
 - Item 1. A group of colleagues from my school or subject group [Collective participation].
 - Item 2. Opportunities for active learning methods (not only listening to a lecturer) [Active learning].
 - Item 3. An extended time period (several occasions spread out over several weeks or months) [Duration].
 - Item 4. Collaborative learning activities or research with other teachers⁷ [Collaboration].

In the international dataset, the OECD included a complex scale index using teachers' responses to these four items, named the effective professional development scale (OECD, 2014b). The scale was generated via confirmatory factor analysis (CFA) (Brown, 2006) and yielded acceptable reliability coefficients, good model-data fit indices and metric level of invariance across countries and economies. Since this index represents the variance shared between collective participation, collaboration, active learning and duration, it is used in this paper in a number of analyses as measuring the delivery of high-quality TPD. Including such a scale in the analysis also allows for the understanding of whether a combined measure of high-quality TPD is able to explain differences in classroom practices. To facilitate interpretation, this scale was standardised within countries and economies to have a mean of zero and a standard deviation of one.⁸

Analysis

The ten classroom outcomes of this study are operationalised as Likert-scaled items based on four ordered levels that represent frequencies of reported implementation of teaching practices in a target class over a one year period – e.g. “Never or almost never”, “Occasionally”, “Frequently” or “In all or nearly all lessons”. Provided that such levels represent a meaningful order of categories to teachers, an ordinal regression model (ORM) was adopted for this paper (Agresti, 2002, 2007; Long and Freese, 2006; Winship and Mare, 1984) to analyse, for each country and economy, the relationships between each outcome and the key explanatory variables.

ORM are used when the outcome of a regression is measured as an ordinal variable with more than two levels (e.g. “Never or almost never”, “Occasionally”, “Frequently” and “In all or nearly all lessons”). The cumulative probability across the sequence of levels is used to reflect the order of the categories. For example, the cumulative probability that a teacher will report a “Frequent” implementation of a teaching method is equivalent to the sum of the probabilities that such instructional practice is used “Never or almost never”, “Occasionally” and “Frequently”.

Based on this measure, the odds of reporting a particular level of implementation are calculated as the ratio between the cumulative probability of such a level and the probability of the remaining levels that indicate more frequency of the outcome variable. To take the previous example, the odds for the level “Frequently” correspond to the cumulative probability of having answered “Frequently”, “Occasionally” or “Never or almost never” divided by the probability of the level “In all or nearly all lessons”.

The natural logarithm of such odds – e.g. labelled as the logit function (Agresti, 2007) – can be modelled through a linear expression based on a number of intercepts and regression coefficients. Specific intercepts are estimated for each cumulative distribution of levels, so each parameter represents the logit function of a particular level of the outcome variable when all the predictors take the value zero. To illustrate, each model developed in this analysis produced three intercepts because the outcome variables had four levels each, so three cut points between cumulative distributions of levels were calculated.⁹

In turn, the regression coefficients in an ORM describe the extent to which one-unit increase in the respective predictor changes the log-odds of reporting a higher level of implementation of the instructional method under analysis, while the rest of the variables in the model are held constant. For instance, the regression coefficient of collective participation indicates the degree to which one-unit increase in such a key explanatory variable changed the log-odds of implementing a particular teaching practice with more frequency in the classroom.

The regression coefficients obtained to describe the relationship between one specific level versus all higher levels of the outcome variable are assumed to be the same as those that describe the relationship between the next lowest level and all higher categories, and so forth. This is referred to as the proportional odds assumption or the parallel regression assumption (Agresti, 2007; Long and Freese, 2006). In other words, the size and direction of each regression coefficient are supposed to be constant regardless of which cut point is taken as reference. Thus, for example, the degree to which a one-unit increase in the collective participation predictor changes the log-odds of implementing a teaching method “Never or almost never” versus “Occasionally” is similar to the degree of changing the log-odds of implementing it “Frequently”, “Occasionally” or “Never or almost never” versus “In all or nearly all lessons”. It is worth mentioning that such a premise can become a strong assumption because the regression coefficients across the levels of the outcome variable do not always produce similar values. However, this paper reports the overall regression coefficient to facilitate interpretation across countries and economies.

Odds-ratios associated with a one-unit increase in the predictors can be obtained from ORM modelling. Odds-ratios are the exponential of the corresponding regression coefficients and share a similar interpretation, but in relation to the odds (not the log-odds) of observing the outcome variable with higher frequency. Thus, for example, they refer to the extent to which a one-unit increase in the predictor (e.g. collective participation) changes the odds of implementing the outcome variable with a higher level of frequency in the classroom. An increase in these odds is indicated when the odds-ratio is significantly greater than 1, whereas an inverse association is denoted in the opposite case (e.g. smaller than 1).

The percentage of change in the odds of implementing the outcomes with higher levels of frequency was then calculated in this paper as the difference between the estimated odds-ratio and 1. For example, if the odds-ratio parameter on collective participation is 0.89 (e.g. smaller than 1), then a one-unit increase in

this predictor is associated with an 11% (e.g. $0.89 - 1 = -0.11$) decrease in the odds of using the predicted instructional practice with more frequency in the classroom, while the rest of variables in the model are held constant.

ORM is used to estimate the logit function of each classroom practice given the linear combination of the features of high-quality TPD (key explanatory variables), using a number of background characteristics of the samples as control variables – i.e. gender, teaching experience and the completion of initial teacher training. I chose these variables because it is probable that teachers with different characteristics experience different levels of exposure to the features of high-quality TPD.

Furthermore, I restricted the analysis to a school fixed-effects model (Clarke et al., 2010; Snijders, 2005) that utilises only variation within schools across teachers in order to remove any across-school differences in unobserved variables that could bias the results. This model relies on the presumption that the contribution of high-quality TPD can be observed with sufficient accuracy among teachers from the same school. In this case, the between-school variance in the reported use of teaching methods can be dispensed for the ORM analysis, in favour of focusing the model only on the differences in these outcomes that are observed within schools. Moreover, this approach serves to acknowledge the hierarchical structure of the data (e.g. teachers nested in schools).

In sum, the magnitude and direction of the relationship between the explanatory variables and the 10 classroom practices for the 35 countries and economies with available data in TALIS 2013 was estimated. Based on these results, a number of descriptive and inferential analyses were added in order to explore relevant policy questions on the cross-national prevalence of the features of high-quality TPD and differences in teachers' exposure within countries and economies, given their gender and their completion of initial training.

NOTES

- 1 . The International Standard Classification of Education (ISCED) is a statistical framework for organising information on education maintained by the United Nations Educational, Scientific and Cultural Organization (UNESCO).
- 2 . TALIS 2013 also offered the opportunity for countries and economies to analyse data from their primary (ISCED 1) and upper secondary (ISCED 3) schools.
- 3 . The section related to TPD in the TALIS teacher questionnaire included the following indication: “If you did not participate in any professional development activities during the last 12 months, please go to Question [x]” (International Project Consortium, 2013, p. 30). Hence, the analysis conditions upon the filtered design of the teacher questionnaire (de Leeuw, 2001).
- 4 . Squared brackets contain the labels used in the charts of the results section.
- 5 . Likert-type scales recoded as: 0= Never or almost never; 1=Occasionally; 2=Frequently; 3=In all or nearly all lessons.
- 6 . Dichotomic variables recoded as: 0= No; 1=Yes.
- 7 . Likert-type scales recoded as: 0= Not in any activities; 1=Yes, in some activities; 2= Yes, in most activities; 3=Yes in all the activities.
- 8 . It is worth mentioning that, since this index did not reach scalar invariance across countries, the corresponding standardised scores are not used for direct comparisons between countries, but only in regression analyses.
- 9 . As the cumulative probability equals one in the highest level, there were no odds associated with this category of response.

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