Organisation for Economic Co-operation and Development

EDU/EDPC/SR/RD(2020)6

For Official Use **English - Or. English**

9 June 2020

DIRECTORATE FOR EDUCATION AND SKILLS
EDUCATION POLICY COMMITTEE

Using ICT to support teachers' professional learning

Draft

Virtual meeting, 22-23 June 2020: 7th Meeting of the Group of National Experts on School Resources and 2nd meeting of the OECD Teachers' Professional Learning Study

The work on this paper was conducted in the context of the OECD Teachers' Professional Learning (TPL) study. This draft was prepared for discussion at the 2nd project meeting of country representatives to the TPL Study on 23 June 2020.

Delegates are invited to:

- DISCUSS the paper and PROVIDE feedback on its content.

Contacts:
Deborah NUSCHE, Senior Analyst, deborah.nusche@oecd.org (+(33-1) 45 24 78 01)
Andreea MINEA-PIC, Analyst, andreea.minea@oecd.org (+(33-1) 45 24 92 78)

JT03462814

Introduction

As in many countries the COVID-19 crisis has made face-to-face professional learning either very difficult or impossible for teachers to attend, online professional learning options for teachers are receiving renewed attention. Many governments and higher education institutions, but also the private sector, have made learning resources available for teachers or provided training on line to support teachers in adapting to remote teaching and new opportunities to build online professional learning communities are being explored.

Data from a recent OECD survey revealed that the provision of professional support and advice to teachers has been one of the key axes of governments' education continuity strategies during the disruption of schooling caused by the COVID-19 crisis (Reimers and Schleicher, 2020[1]). Such support has mainly included the provision of access to resources, peer networks as well as professional development, and has been mostly based on online resources (e.g. digital platforms). In some systems, there has been work on the development of MOOCs or intensive training for teachers dedicated to the creation of distance learning courses. A majority of respondents in the recent OECD survey also indicate that training and counselling for teachers are part of school reopening plans in their country.

This paper brings together background information to support an idea exchange among countries on the opportunities and challenges brought by new technologies for teacher professional learning. In particular, it puts forward research and analytical work on what is already known on teachers' use of ICT for professional learning prior to the COVID-19 crisis in order to provide a basis for exchanging on the current situation and on how well countries are prepared in ensuring the continuity of teachers' learning.

New technologies bring immense potential for transforming teacher learning and the delivery of professional development activities throughout teachers' careers. Teachers can browse the Internet for relevant information, use open education resources to support their work, participate in massive open online courses (MOOCs) or engage in online communities to share resources and experiences with other teachers. Descriptive analyses based on TALIS (2018) data show that that teachers who use ICT more frequently in the classroom and those who feel more at ease supporting student learning using new technologies, are more likely to have participated in online courses or seminars as part of their professional development activities. ICT can also provide new solutions for preparing lessons, assessing student grades or doing administrative tasks more effectively, thereby allowing teachers to save time for their own learning. At the same time, many gaps remain in research related to teachers' professional learning online and there is room for countries to learn from each other.

The paper first presents research evidence on the effectiveness of various forms of online learning for teachers and for adults more generally. It then examines prerequisite conditions for enhancing teacher learning through new technologies, focusing on teachers' access to ICT and digital competence. Teachers' engagement in online learning activities, as captured by OECD surveys, provides a basis for investigating how policies can support teachers' engagement in professional learning online.

In line with the conceptual framework of the Teachers' Professional Learning (TPL) Study, teacher professional learning is defined as "formal and informal activities that aim to update, develop and broaden the skills, knowledge, expertise and other relevant characteristics of in-service teachers". Online professional learning covers therefore learning activities in a broad way, whether these are formal online degrees or exchanges in online communities that allow teachers to enhance their skills.

The potential of new technologies for transforming teacher learning

Digitalisation can enhance teachers' learning opportunities, transforming the delivery of professional programmes and materials but also the way teachers connect to each other and conduct other teaching-related activities. Online delivery of professional development can allow reaching a greater number of teachers more rapidly and from anywhere, diversifying the design of traditional professional development courses in terms of duration, depth and topics covered, providing new certification options (Vuorikari, 2018[2])and offer new opportunities to expand teacher-centred collaborative learning opportunities in the virtual space.

At the same time, digitalisation also transforms the way workers, including teachers, carry out their tasks at work. Some tasks can get automated, whereas others can be performed differently or more efficiently thanks to the use of digital tools (OECD, 2019[3]). For teachers, new technologies have the potential to transform the way some tasks (e.g. administrative work, assessments) are carried out, allowing teachers to free up time to devote to their own learning. In addition, workers evolving in more digitally-intensive environments are more likely to maintain their skills, tend to learn more from co-workers, learn more by doing and keep up to date more. As workers and teachers increasingly use technology in the workplace, they perform tasks differently and this also impacts the way they develop their own skills (OECD, 2019[3]).

Effective online learning for teachers and other adults: what we know from research

Research and evidence on teachers' learning: online courses, MOOCs and communities

Research on teachers' online learning has relied on a diversity of methodological approaches and many gaps remain in the area. Existing studies tend to suggest that the principles and features that enhance the effectiveness of traditional professional can also guide the design and assessment of online teacher professional learning (Vuorikari, 2018[2]; Prestridge and Tondeur, 2015[4]; Philipsen et al., 2019[5]).

(Desimone, 2009[6]) identifies five critical features of effective professional development: content focus, active learning, coherence with teachers' knowledge and belief as well as wider policies, longer duration and embedded in collective practice. In an inventory of innovative practices of teacher professional learning[1] analysed in relation to the key features of effective professional development, (Vuorikari, 2018[2])shows that all identified practices rely on active learning, and a great number of them are based on modelling effective practices and support collaboration in job-embedded contexts. Coaching and expert support were less recurrent. Other evidence emphasises that online programmes aimed at teacher learning should account for teachers' background (experience, skills, needs), be aligned with the curriculum and include design features (e.g. interactive videos) that stimulate teacher motivation to remain engaged with the course (Qian et al., 2018[7]).

As teachers represent a large share of MOOC learners and as MOOCs providers are progressively shifting their model towards online professional degrees and credential programs (more on this below), there is increasing potential for teacher professional learning to expand in online formats (Seaton, Coleman and Daries, 2014[8]; Reich and Ruipérez-Valiente, 2019[9]; Littenberg-Tobias, Slama and Reich, 2020[10]). Yet, research on

[1] All these practices are not necessarily technology-based.

the effectiveness of MOOCs for teachers and educational professionals is still emerging. Evaluating their effectiveness is complex given that MOOCs face the double challenge of designing standard content to be delivered on a large-scale while at the same time aiming to provide the flexibility for teachers to link this content to their own practice and context (Littenberg-Tobias, Slama and Reich, 2020[10]).

In a mixed-methods study of four MOOCs on change-leadership for educators implemented in the United States, (Littenberg-Tobias, Slama and Reich, 2020[10]) emphasise that course content and in particular, "hooks" to teachers' own practices by providing learners with opportunities to relate the content to their own activities, were important elements in driving transformations in practices. The flexibility of the course design is crucial, as it enables MOOCs to easily connect content designed for large-scale audiences to learners' own context. The context in which teachers or education professionals worked also mattered for how learners adapted to the course requirements (e.g. teachers in less supportive school environments tended to rely more on online collaboration with other learners rather than on sharing resources and collaborating with teachers in their own school), but it did not lead to more limited changes in teacher practices. Teachers adapted their interaction with the course content based on their specific contexts and needs. In addition, teachers' skills and previous experience in online environments also shape their engagement in MOOCs. Without guidance and a design that supports less-experienced teachers, MOOC environments can be challenging for novice participants who may face difficulties in engaging or navigating through resources (Karlsson and Godhe, 2016[11]).

Beyond the opportunity to expand knowledge, engagement in MOOCs, as well as in other forms of online learning, can enable teachers to be part of wider communities, with potential effects on a variety of social and organisational outcomes. While most teachers engage in courses or seminars as part of their professional development, participation in professional development networks or peer-observation is not widespread, despite increasing evidence on the effectiveness of the latter (OECD, 2019[12]). In this respect, online communities provide teachers with enhanced opportunities for exchanging, sharing resources and learning collaboratively.

Data on participants in informal online communities and networks collected from a number of studies between 2009 and 2016 showed that online community members were more likely to be women, aged 40-59-years-old and especially motivated by the potential to enhance their teaching practices thanks to exchanges with other teachers and emotional support (Macià and García, 2016[13]). Teachers engage in online communities and networks on a diversity of digital environments (e.g. wiki, networking sites, platforms, learning management systems) and rely on various tools (e.g. forums, instant messaging, podcasts) to interact with each other (Macià and García, 2016[13]; Cranefield and Yoong, 2009[14]).

Both formal and informal teacher communities can be useful at enhancing supportive and collegial professional practices and be valuable sources of professional learning. Recent research reviews of empirical literature on online communities provide evidence that teachers tend to engage in such communities primarily for topics related to teaching with technology or other educational technology issues (Lantz-Andersson, Lundin and Selwyn, 2018[15]; Macià and García, 2016[13]). Typically, there is a lot of variation in the intensity with which teachers engage in online communities, with a minority of them participating actively and thereby influencing the way the community unfolds its exchanges, whereas the rest act as more passive users or consumers.

A case study on a Korean teacher-created online community brings an illustration of these findings, as teachers use the online community more as a resource bank rather than for collaboratively developing teaching materials (Seo and Han, 2013[16]). Teaching materials

created by less than 1% of teachers in the community were massively used by the remainder of teachers, without any changes made to these materials after their use in class. The community led to a standardization of teaching practices, especially since teachers rarely criticised materials posted by other teachers. In fact, teachers' reluctance to criticism in the online space tends to replicate similar attitudes observed in face-to-face collaborations whereby teachers seek to avoid disagreements, which may also translate into reduced benefits teachers can derive from exchanging with their peers (Dooner, Mandzuk and Clifton, 2008[17]).

Indeed, online communities, and in particular informally-developed ones, have been found to often serve as a mean for teachers to filter information thanks to their colleagues (Lantz-Andersson, Lundin and Selwyn, 2018[15]). However, information sharing or exchanges appear to be done quickly or in superficial ways, and discussions often occur in consensual forms, conforming to rather than challenging community norms. At the same time, communities can also benefit from more silent participants or "lurkers", as passive participation can be a first step in engaging more actively (e.g. posting material, participating in discussions). In the Korean teacher-created online community, teachers who posted materials frequently reported having been passive users at first (Seo and Han, 2013[16]). More research is needed on the impact of more passive or superficial forms of interaction both on teacher learning and on teaching practices, but also on which and how different types of users (active or passive) benefit from these exchanges and on how time affects participation. Similarly, many gaps remain with respect to how different types of technological configurations, applications or platforms shape teachers' practices in online communities (Lantz-Andersson, Lundin and Selwyn, 2018[15]).

Participation in online communities or networks can be shaped by a variety of factors. Blended models of online communities, that combine virtual and in-person interactions, appear to be preferred by teachers relative to purely virtual ones (McConnell et al., 2013[18]) and also to translate into stronger member relationships and participation. Such models tend to be associated with higher levels of trust and sociability between community members, which favour knowledge sharing and exchanges but are more difficult to foster when participants only meet online (Matzat, 2010[19]; Matzat, 2013[20]). In addition, moderators play a key role in encouraging member participation, guiding and ensuring the continuity of the community (without dominating exchanges) (Lantz-Andersson, Lundin and Selwyn, 2018[15]; Macià and García, 2016[13]). The time they need to support the community, as well as their skills and experience in the area of online community building are likely to shape the extent to which that they are able to effectively co-ordinate and moderate the community. Time constraints can in fact be a significant barrier for teacher engagement in both formal and informal communities, either because such activities take place during teachers' free time and amplify their work burden, or because of the difficulty in organising synchronous activities with teachers from different time zones or who lack the skills to rapidly navigate in the virtual environment (Lantz-Andersson, Lundin and Selwyn, 2018[15]).

Evidence on the extent to which engagement in online forms of learning, and in particular in online communities, translates into actual changes in teacher practices remain scarce and it is often based on teacher self-reports. In a randomised experiment, (Dash et al., 2014[21]) show that while participation in an online professional development course of sustained duration translated into enhanced pedagogical content knowledge and changes in pedagogical practices, it did not lead to higher student achievement. Given the evaluation design, teachers are likely to have had only limited opportunities to actually implement the learning material content in the classroom, despite measured changes in indicators of self-reported practices. In contrast, (Choi and Morrison, 2014[22]) rely on classroom observation data together with threaded online discussions to investigate changes in

classroom practice and teacher perceptions following a blended professional development programme for teachers. Participation in the professional development programme was found to be associated with positive changes in classroom practices.

At the same time, outcomes derived from participation in online learning activities can extend beyond the more conventional set of professional development ones related to improvements in teacher knowledge and changes in teaching practices (Yurkofsky, Blum-Smith and Brennan, 2019[23]). While participation in online learning can allow teachers to enhance their content knowledge and skills, it can also impact on other types of outcomes (e.g. professional identity, reflection on own learning, social relationships, self-confidence and enthusiasm for own work) (Karlsson and Godhe, 2016[11]; Beach, 2017[24]) (Lantz-Andersson, Lundin and Selwyn, 2018[15]). Examining teacher participation in a technology-related MOOC, (Yurkofsky, Blum-Smith and Brennan, 2019[23]) find evidence that the course provided teachers with new ways of engaging with colleagues and administrators (e.g. by constructing similar courses for colleagues in their area), as well as to connect and construct virtual communities (e.g. with teachers from other places) for sharing resources, building their identity and solving issues they encounter in the classroom. Teachers reported feeling less isolated as they could locate their own work in a wider community. Similar evidence from research on online communities shows that teacher engagement in such networks can be particularly beneficial to novice teachers in terms of building their professional identity and confidence (Macià and García, 2016[13]).

Research and evidence on adult learning more generally: online courses and MOOCs

More general research on effective adult learning online can also provide insights relevant for teachers' professional learning specifically. A range of experimental studies have examined the effectiveness of both more conventional online courses - either as part of online degrees or as modules of in person degrees combining online and in person learning - as well as emerging forms of online learning in the shape of MOOCs (Escueta et al., 2017[25]).

Online courses offer the possibility of both reducing costs associated with the implementation of face-to-face learning as well as providing flexibility for learning for those who would otherwise not engage due to time or location constraints. Experimental and quasi-experimental studies on online courses unfolded at the post-secondary level tend to find, however, that purely online learning environments are less beneficial to learners than in person, in terms of participants' achievement, but also further progression (Escueta et al., 2017[25]; Bulman and Fairlie, 2016[26]).

There is also evidence that learning outcomes from online courses appear to be weaker particularly among students with lower academic achievement (Xu and Jaggars, 2016[27]) (Bettinger et al., 2017[28]). (Xu and Jaggars, 2016[27]) focus on students from community and technical colleges in the United States and show that performance gaps associated with participation in online courses were wider for students with lower grade point averages, but also for students in some specific subjects (e.g. social sciences and applied professions). (Bettinger et al., 2017[28]) study the performance of students in more than 700 courses at a large for-profit university in the United States that delivers both online and in-person courses. Participation in online courses translated into lower academic success and progression (grades in future courses and likelihood of remaining enrolled a year later) compared to in-person courses. Its negative impact is also higher for students with lower prior GPA.

In contrast, blended environments that combine online courses with face-to-face ones enable similar learning outcomes to in-person courses and may represent a suitable option allowing to decrease costs while ensuring high-quality delivery of learning (Escueta et al., 2017[25]). (Alpert, Couch and Harmon, 2016[29]) examine simultaneously the effectiveness of online, blended and in-person courses formats for students in economics at a large public university in the United States thanks to a randomised experiment. In the blended format, students met with an instruction for a discussion period and had access to the online lecture material. In the online setting, asynchronous discussion took place via Facebook groups, the level of participation being part of the course grade. Students who attended the online course displayed poorer learning outcomes than those in the face-to-face format, whereas those engaged in the blended format performed on a par with students attending the face-to-face format.

Classroom time matters even when learning material is available for students online. In an earlier study, (Joyce et al., 2015[30]) examined the effect of class time on college students' performance in a setting where students also had access to online course material. The study was performed at a public university in an urban area (in the United States) attended by many students who commuted. Students who benefitted from more face-to-face instruction (2 classes of 75 minutes a week in person with the teacher for the duration of the course) displayed higher learning outcomes than those enrolled in a compressed version (one class of 75 minutes a week), but non-cognitive measures (related to effort) were similar for both groups.

Little is known, however, on the success of online courses in expanding participation to those who would not have engaged in such learning activities otherwise. Goodman, Melkers and Pallais (2019[31]) provide first evidence in this respect, focusing on Georgia Tech's Online Master of Science in Computer Science and showing that online delivery of education increases the number of individuals that pursue education. Flexibility in terms of location and time was an essential feature attracting candidates to the degree, even more than the lower costs relative to the in-person version. The online degree expanded overall educational enrolment, attracting mid-career individuals who would have not enrolled otherwise, while the in-person version drew younger applicants. Displaying lower costs than its in-person version, the online degree provided high-quality instruction and online students slightly outperformed those who attended in-person. In addition, surveys of applicants showed that the online degree had not substituted for non-degree options, but that the programme had increased total training participation.

Since 2012, the number of MOOC courses has been on a steady rise and in 2019, there were more than 110 million MOOC learners around the world, excluding China (Class Central, 2019[32]). Since their inception, however, MOOCs have constantly displayed low retention and completion rates, and similar to more traditional forms of adult education, have tended to draw learners who are highly educated, from wealthier neighbourhoods and countries (Reich and Ruipérez-Valiente, 2019[9]; OECD, 2019[3]). At the same time, individuals may engage in MOOCs for a variety of reasons and non-completion may also reflect that individuals obtained the information they needed from the course without finalising it. Similarly, early dropout may also be an indicator of the low quality of certain courses or their mismatch with learners' needs. Indeed, very little information is available on the quality of MOOCs and their effectiveness in enhancing learner' outcomes.

Research on participation in MOOCs has therefore focused more on the extent to which experience using MOOCs can be enhanced, so that those who engage make the most of it. The experimental and quasi-experimental literature has examined interventions that seek to enhance effort and completion. Interventions based on social comparisons, by which learners receive information related to the performance of other learners, have been

effective at improving MOOC learners' outcomes (performance and completion) (Escueta et al., 2017[25]). (Davis et al., 2017[33]) develop a personalised feedback system that allows learners to compare themselves with previous learners that have been successful in the course. While completion rates increase, feedback benefitted more the highly-educated. Other studies have found that commitment devices seeking to minimise distraction and reduce procrastination, as well as planning prompts students receive at the beginning of the course and that encourage them to plan their course participation from the onset, were successful at enhancing completion rates (Patterson, 2018[34]; Yeomans and Reich, 2017[35]).

Prerequisites for enhancing teacher learning through new technologies

Access to ICT

Access to new technologies is the first prerequisite for teachers, similarly to other adults, to make the most of digitalisation for developing skills, especially when the provision of such learning activities is not ensured by employers/they engage independently in such activities. Whether learning activities take place in schools or at teachers' home, having the necessary digital devices, a good quality Internet connection and the skills to rely on these tools to unfold more complex activities are required to allow teachers to engage in online learning activities.

Little is known, however, on teachers' access to digital tools and Internet connection outside of the school premises. While the digital divide in terms of access has progressively been narrowed across OECD countries, inequalities in access remain, especially between rural and urban areas. Rural areas are lagging behind urban ones in all OECD countries in terms of their access to fixed broadband with a sufficient speed to allow using advanced connected devices and services (OECD, 2019[36]). Similarly to other individuals, teachers living in rural areas are likely to be affected by the lower quality of Internet connections and hence, to experience more difficulties in using online learning resources to their best advantage. In addition, the recent Covid-19 crisis has emphasised the importance of having access to a computer or a digital device allowing to continue teaching and learning from home. However, in 2017, on average across 25 OECD countries with available data, 65% of households with income in the bottom quartile reported having access to a computer at home in contrast to more than 96% of households with income in the top quartile (OECD, 2020[37]). Teachers' salaries display wide variability both across and within OECD countries (OECD, 2019[38]), and while data on teachers' connectivity from home are lacking, some teachers may not have the resources to afford high-quality digital tools to engage in more sophisticated Internet activities.

Teachers' digital competence

In addition, teachers' skills are equally crucial to ensure they can tap into the potential of new digital tools for learning. The digital divide, which had initially focused on gaps in Internet access, increasingly relates to divides in the ways individuals use digital devices and the Internet. Skills are important drivers of such gaps. Higher cognitive skills-literacy, numeracy or problem-solving skills in technology-rich environments, or a mix of them - enable individuals who go on line to move from elementary uses of Internet to more complex and diverse uses (OECD, 2019[3]). In OECD countries with available data in the OECD Survey of Adult Skills (PIAAC), the share of teachers with low problem-solving skills in technology-rich environments ranges from less than 5% in Australia to 31% in Israel. Substantial differences across countries are also observed in terms of teachers' literacy and numeracy skills (Hanushek, Piopiunik and Wiederhold, 2014[39]).

While low-skilled teachers tend to display similar shares of participation in open or distance education as high-skilled ones (Figure 2), mere participation does not guarantee that teachers are actually effective in their online learning experience. Evidence on teacher engagement in online courses, MOOCs or online communities indicates that there is a need to enhance teachers' digital competence in order to allow them to participate in and seize the benefits of online learning (Dash et al., 2014[21]; Macià and García, 2016[13]). Teachers with higher digital competence or capacity to quickly navigate online resources, and make critical uses of them, are likely to be more efficient in their learning, progress faster and achieve desired goals in less time. In addition, higher-skilled teachers may also choose their online learning sources better, targeting higher quality courses or resources, and moving into more complex uses of such resources. Once teachers engage in online learning activities, the way they use these learning sources and the type of benefits they derive from them are likely to be dependent on their skills. Expanding access to professional learning opportunities online is unlikely to be sufficient in reaching more teachers in need of professional learning or be effective for those who already go online, if teachers' skills are insufficient for them to make the most of these new learning resources. However, little is known on teachers' ability to access and use digital tools, and while the OECD Survey of Adult Skills (PIAAC) measures proficiency in problem solving in technology-rich environments, the assessment's primary focus is on the cognitive dimensions of problem solving rather than on digital skills per se.

Teachers' engagement in technology-based learning activities

The COVID-19 crisis has brought digital resources and the online provision of training to the forefront of policy solutions to ensure the continuity of teacher professional learning in the absence of facet-to-face training options. Enhancing teacher engagement in technology-based learning activities can pave the way for more effective uses of digital resources by teachers for their own learning, as they become more familiar with a wealth of resources, methods and ways of learning and can make more productive uses of such resources.

There are currently many gaps in terms of data and research related to teacher enrolment but also the profile of teachers engaging in online forms of professional learning, particularly from a cross-country comparison perspective. OECD surveys such as the Survey of Adult Skills (PIAAC) and the Teaching and Learning International Survey (TALIS) allow providing some contributions in this area.

How teachers engage in open or distance education relative to other high-skilled workers

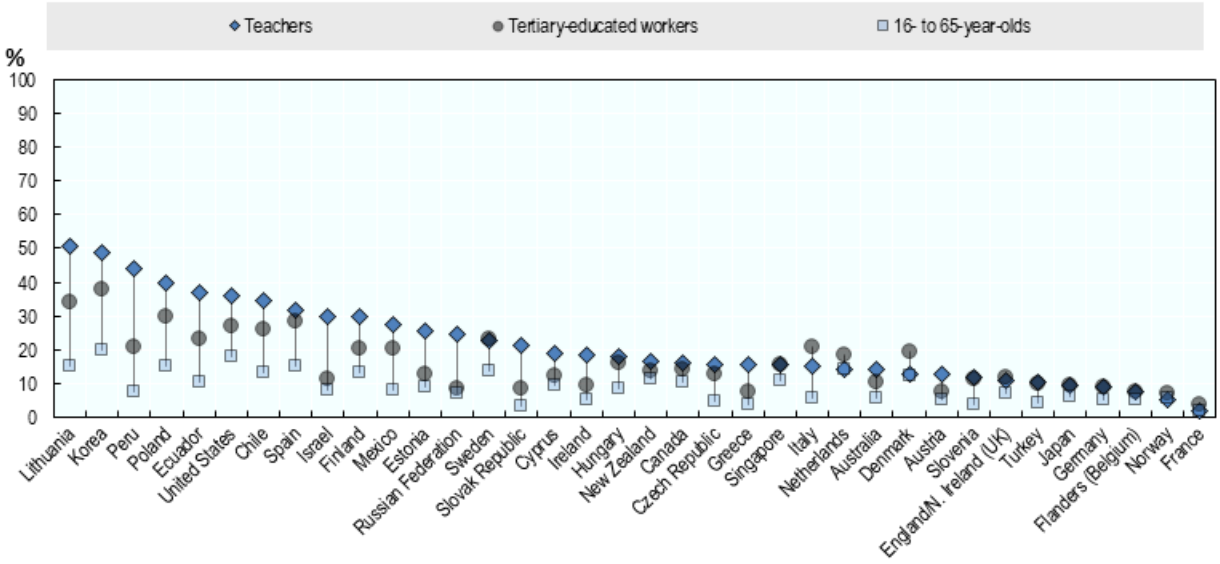
The Survey of Adult Skills (PIAAC) contains questions related to adults' participation in open or distance education. Open or distance education is defined as not leading to formal qualification and covers courses that are "similar to face-to-face courses but take place via postal or correspondence or electronic media, linking together instructors, teachers and tutors or students who are not together in the classroom". Countries participating in the Survey of Adult Skills (PIAAC) were surveyed in three rounds - 2012, 2015 and 2017. Hence, open or distance education participation is more likely to capture engagement in MOOCs rather than in more traditional forms of open education in 2015 and 2017 rather than in 2012 (when MOOCs were only beginning).

When it comes to teachers' engagement in open or distance education, teachers display higher participation rates than other tertiary-educated adults (Figure 1). Among OECD countries with available data in the Survey of Adult Skills (PIAAC) around 21% of teachers had participated in open or distance education in the 12 months before the survey, in

comparison to 16% among high-skilled workers and less than 10% in the entire 16-65 years old population covered by the survey. In countries with lower levels of engagement in open or distance education, teachers are as likely and sometimes less likely than other adults to participate in such courses. In Korea, one in two surveyed teachers reported having participated in open or distance education in the year preceding the survey.

Figure 1. Teachers' participation in open/distance education

Percentage of the population having participated in open or distance education in the 12 months before the survey, 16-to 65-year-olds[2]



Note: Chile, Greece, Israel, Lithuania, New Zealand, Singapore, Slovenia and Turkey: Year of reference 2015. Ecuador, Hungary, Mexico, Peru and United States: Year of reference 2017. All other countries: Year of reference 2012.
Source: OECD calculations based on the OECD Survey of Adult Skills (PIAAC) (2012, 2015 and 2017).

Adults' participation in open or distance education tends to reproduce existing inequalities in participation in more standard forms of adult learning. Younger, more educated or skilled adults are more likely to engage in such forms of flexible training. In this respect, the potential of open education at reaching those adults most in need of training can be further explored (OECD, 2019[3]).

At the same time, in the teacher population, lower skilled and higher skilled individuals tend to display similar engagement in open or distance education. Participation rates are comparable for low-performing and top-performing teachers in literacy or problem solving in technology-rich environments (Figure 2): teachers want to learn, upgrade and expand on their skills, suggesting a high willingness to learn, even when they are low-skilled. Indeed,

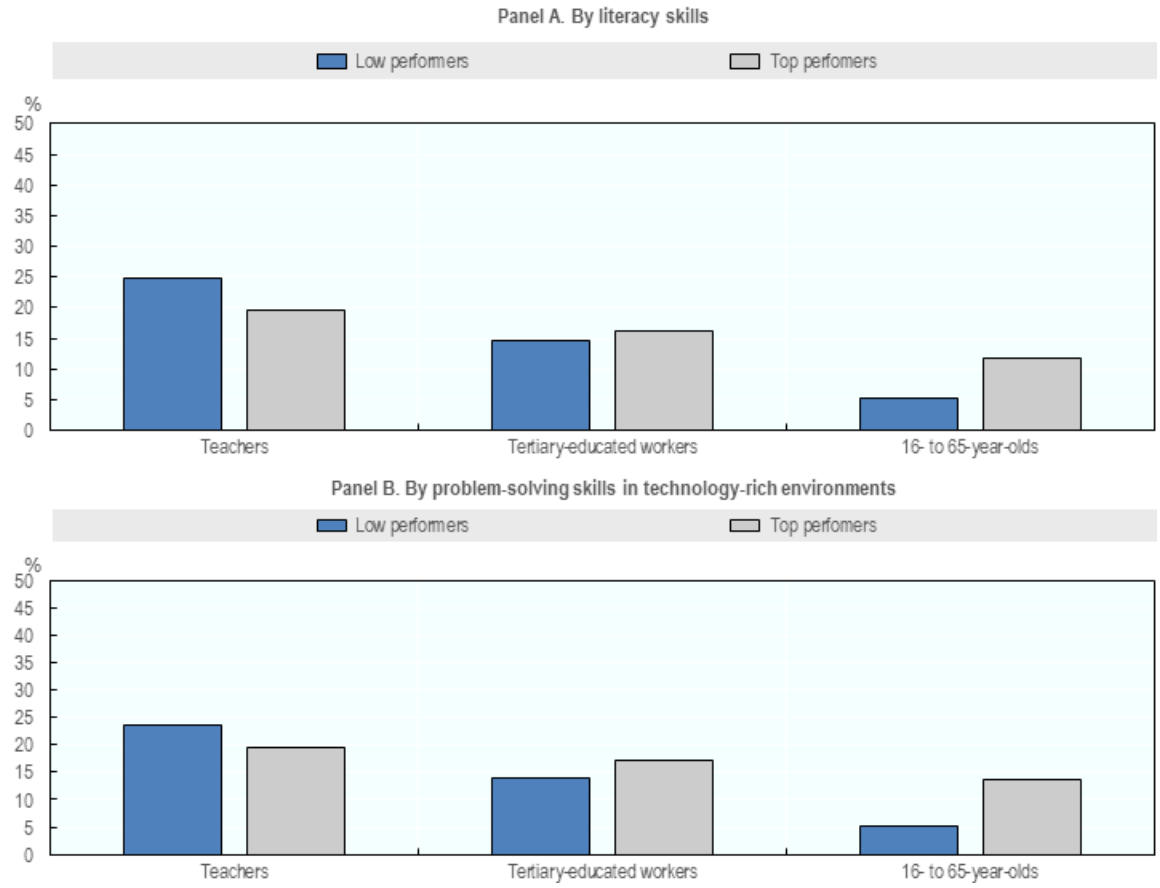
[2] Note by Turkey
The Information in this document with reference to "Cyprus" relates to the southern part of the Island. There is no single authority representing both Turkish and Greek Cypriot people on the Island. Turkey recognises the Turkish Republic of Northern Cyprus (TRNC). Until a lasting and 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.

low-skilled teachers, similarly to other tertiary-educated adults, display a higher readiness to learn than other low-skilled individuals (Figure 3). Low-skilled teachers may want to bridge a gap in skills by additional training and open or distance education can provide them some flexibility.

At the same time, teachers' participation in open or distance education alone does not guarantee that teachers make the most of these technologies and use them at their full potential, so that they are actually impactful. These data do not allow capturing the outcomes of participation and whether these vary by teachers' skills. Returns to such forms of training may end up being higher for those who are already high-skilled.

Figure 2. Participation in open/distance education by skills proficiency

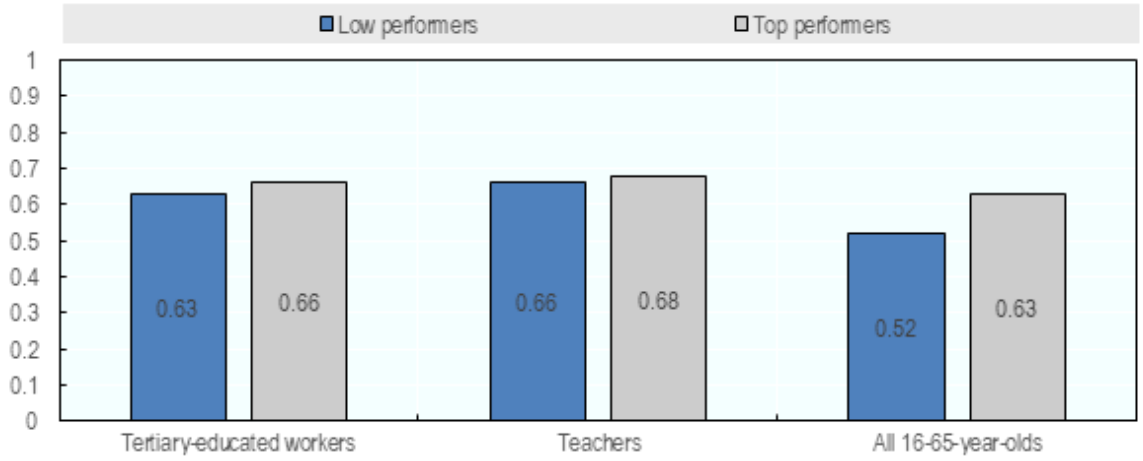
As a percentage of each category



Note: In the PIAAC questionnaire, open or distance education is defined as not leading to formal qualification. It covers courses that are similar to face-to-face courses but take place via postal or correspondence or electronic media, linking together instructors, teachers and tutors or students who are not together in the classroom. Teachers and non-teachers are defined based on the population of adults aged 25-65 years old. Teachers are adults self-reporting working in the following two-digit occupations as classified by the International Standard Classification of Occupations (ISCO-08): Teaching Professionals (ISCO 23). Non-teachers are all adults in employment with a tertiary education as defined by 1997 International Standard Classification of Education (ISCED): Tertiary (ISCED 5B, 5A, 5A/6). Poor performers in problem solving in technology-rich environments are defined as scoring at most *Below Level 1* (inclusive) in problem solving (including failing ICT core and having no computer experience), while top performers score at least *Level 2* (inclusive). Poor performers in literacy score at most *Level 1* (inclusive), while top performers score at least *Level 3* (inclusive).
Source: OECD calculations based on the Survey of Adult Skills (PIAAC) (2012, 2015 and 2017).

Figure 3. Readiness to learn, by skill proficiency

Average readiness to learn



Note: Using the methodology of (Grundke et al., 2017[40]), the index of readiness to learn is built based on the following survey items: I like to get to the bottom of difficult things; If I don't understand something, I look for additional information to make it clearer; When I come across something new, I try to relate it to what I already know; When I hear or read about new ideas, I try to relate them to real life situations to which they might apply; I like learning new things; I like to figure out how different ideas fit together. A higher score is associated with a higher readiness to learn.
Source: OECD calculations based on the Survey of Adult Skills (PIAAC) (2012, 2015 and 2017).

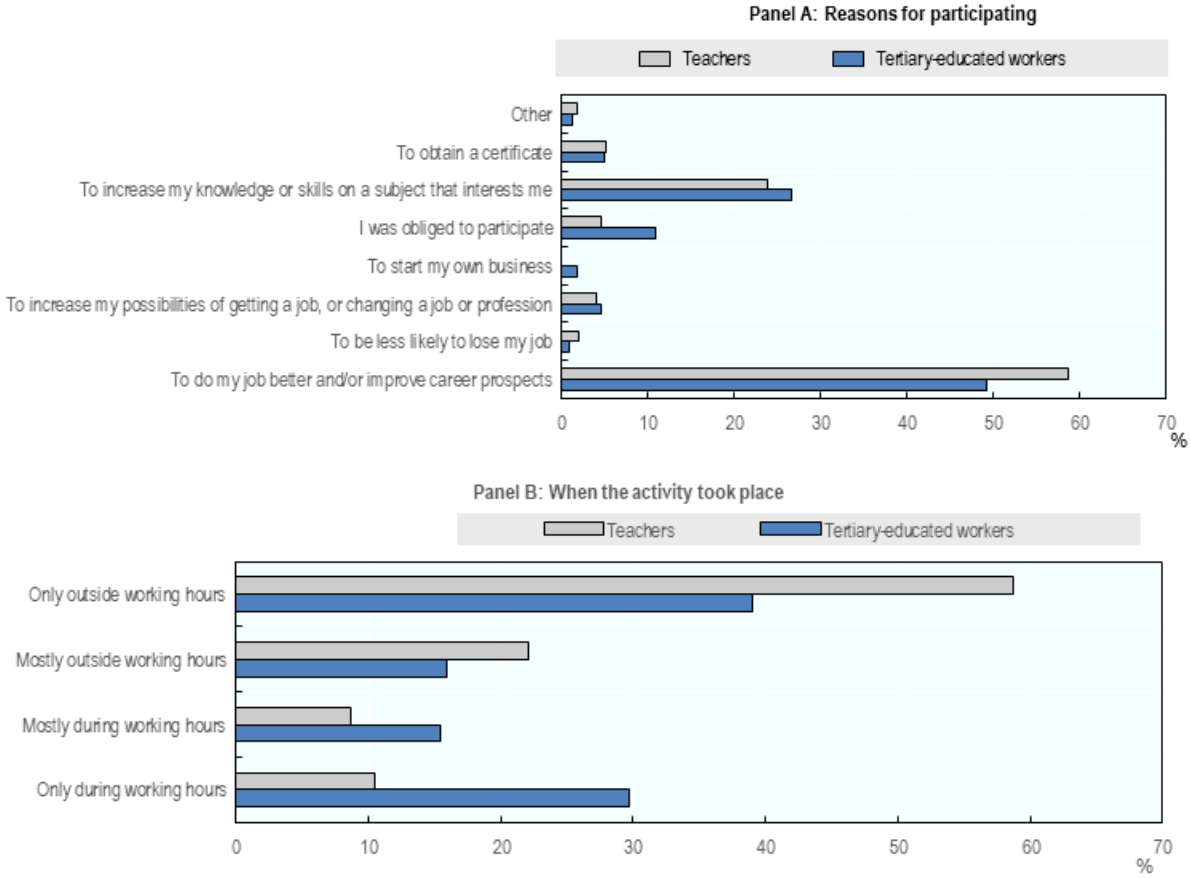
Teachers engage in open/distance education overwhelmingly for job-related reasons: 91% of them (and 81% of tertiary-educated workers) reported that their participation in open/distance education was job-related and more than half of them found it very useful for their job. Doing better at their job and/or improving career prospects is the main reason driving teachers' participation (59% of teachers), even more than for other tertiary-educated workers (49%)(Figure 4).

While teachers engage in open/distance education mostly for job-related reasons, these activities tend to take place outside of their working hours, in contrast to other tertiary-educated workers. More than 60% of teachers surveyed in the Survey of Adult Skills (PIAAC) reported that they had engaged in open/distance education only outside working hours and another 20% that they had done so mostly outside working hours. In contrast, for one third of tertiary-educated workers, participation in open/distance education occurs only during working hours.

Digitalisation increasingly expands the opportunities for learning flexibility as well as for novel forms of on-the-job training. At the same time, when work-related professional learning increasingly takes place outside of school hours, there is a risk that it may add on to teachers' workload and negatively affect their well-being. For instance, the provision of professional learning activities outside of working hours as well as requirements set by public authorities (e.g. renewal of teacher registration or re-certification programmes conditional on teachers undergoing a given number of professional learning hours) in some contexts can over-burden teachers by constraining them to use their personal time for these activities.

Figure 4. Participation in open/distance education – reasons and time

For individuals who have participated in distance/open education in the 12 months before the survey



Note: Panel B: The question on "When the activity took place" refers to the "degree that the activity takes place during working hours meaning that the working hours are used to attend the activity instead of working. It also includes the case where a number of working hours are being replaced by the learning activity even if the activity itself takes place outside normal working time of the respondent. If the learning activity takes place outside working time and the respondent has received payment for the hours, the activity should be coded as during working hours. The answer should only reflect the participation in the course itself and not homework."
Source: OECD calculations based on the OECD Survey of Adult Skills (PIAAC) (2012, 2015 and 2017).

Teachers' professional learning on line

In TALIS, professional development is defined as "activities that aim to develop an individual's skills, knowledge, expertise and other characteristics as a teacher" (OECD, 2018[41]). It can therefore cover both formal and non-formal types of activities undertaken by teachers after their initial education or training to enhance their skills. Items related to engagement in professional development activities in TALIS do not allow distinguishing whether these activities were a part of a formal programme or searched for independently by teachers. Professional development activities as defined in TALIS should be thus understood in a broad sense, as activities in which teachers engage to expand their skills after their initial education or training, whether these are formally provided to teachers by schools or public education authorities, or undertaken by teachers independently at home (e.g. MOOCs).

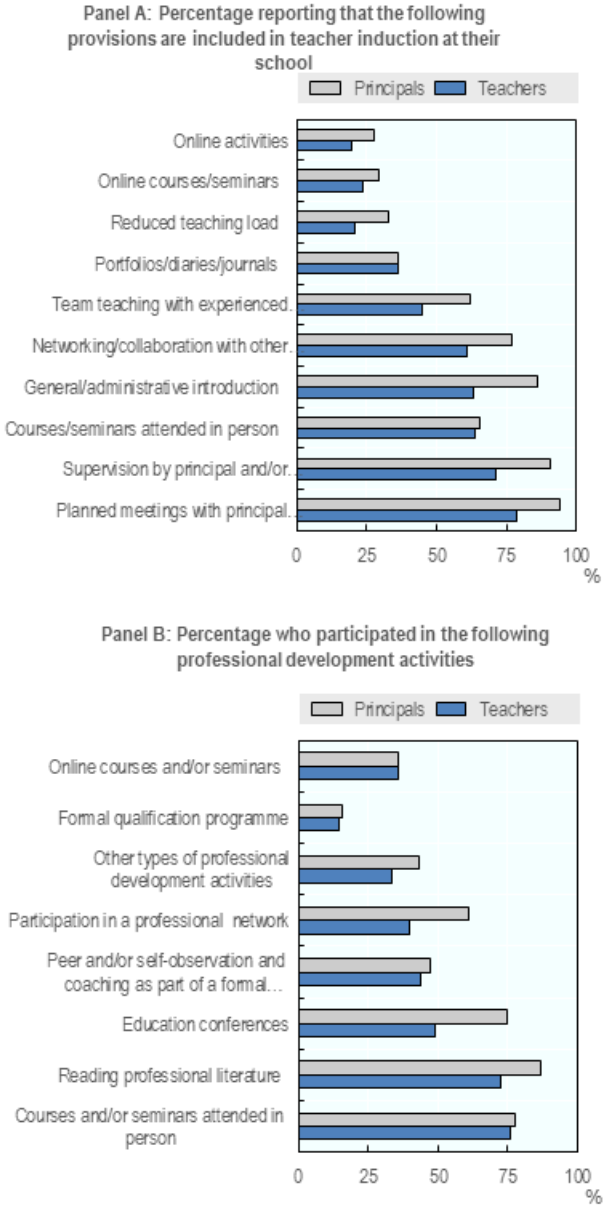
The professional development section of TALIS also comprises information on the induction activities in which teachers engaged when they joined their current school. Induction activities are "designed to support new teachers' introduction into the teaching profession and to support experienced teachers who are new to a school, and they are either organised in formal, structured programmes or informally arranged as separate activities" (OECD, 2018[41]). Such induction-related provisions can therefore be offered at the system or school-level (or both) (OECD, 2019[12]).

Data from TALIS (2018) show that teacher engagement in online forms of professional learning is not widespread (Figure 5). Across OECD countries with available data, around 34% of lower-secondary teachers had participated in online courses/seminars as part of their professional development activities and a similar share of school principals. Online courses/ seminars are among the least recurrent forms of professional development reported by teachers in OECD countries with available data in TALIS (2018). A similar picture emerges when it comes to induction activities proposed to teachers as they joined their current school: less than one in five teachers reported having benefitted from online courses/seminars and online activities (e.g. virtual communities) as part of their induction provisions.

Principals are more numerous to report teacher engagement in online forms of induction activities. Indeed, the provision of online-based induction activities is likely to have increased in recent years, and hence to be reflected in principals' reports about what is currently being provided in their schools. By contrast, teachers who have been in the school for a long time already may be less likely to have benefitted from such forms of induction at the time they joined their current school. Discrepancies between teachers and principals' reports for other forms of induction activities may also stem from the fact that some provisions may not be necessary for all teachers joining the school (e.g. reduced teaching load for more experienced teachers) or all teachers may not be encouraged to engage in them (OECD, 2019[12]).

Figure 5. Teachers' engagement in learning activities delivered online

Percentage of lower-secondary teachers



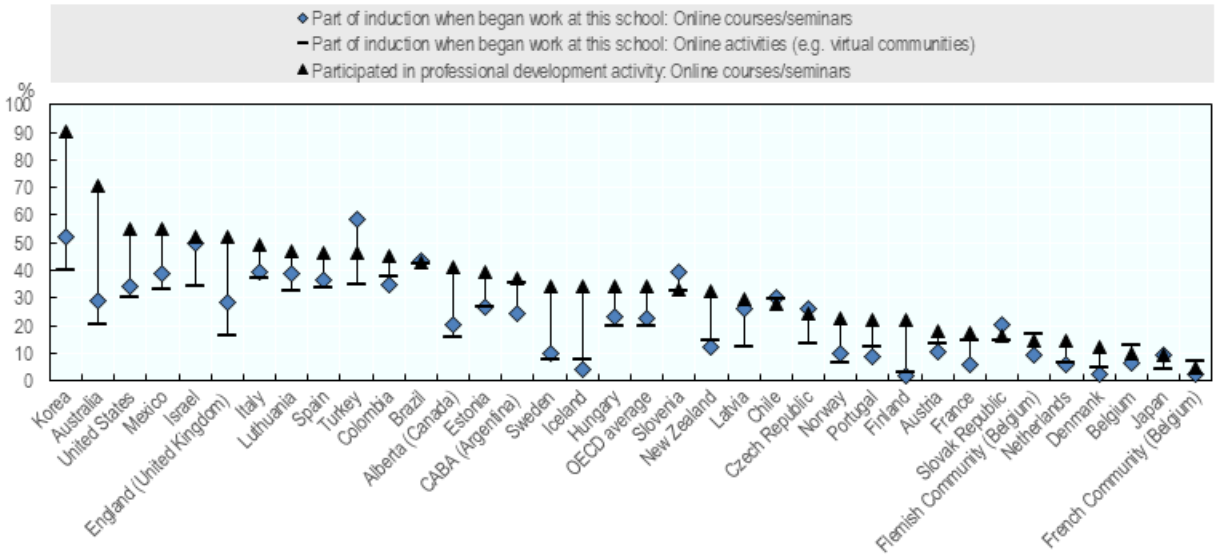
These figures hide large cross-country variations in participation levels (Figure 6). In Korea, professional development unfolded through online courses or seminars is the type of professional development activity reported by most lower-secondary teachers. More than 90% of teachers in Korea reported having engaged in such activities in the year prior to the survey, in contrast to fewer than 15% of lower-secondary teachers in Belgium, Denmark, Japan and the Netherlands. While Belgium, Denmark and the Netherlands, are ahead of most other OECD countries in terms of the digitalisation of their economies and societies (OECD, 2019[3]), reliance on ICT tools for teacher professional development is less recurrent. Korea also displays the highest shares of teachers reporting to have engaged in online forms of induction activities.

While participation in induction activities unfolded on line is likely to be determined by the level of provision of such activities at the school or system level, engagement in professional development activities may depend on a variety of factors. However, data from TALIS show that teacher participation in online professional learning appears is rather homogeneous across various teacher and school-level characteristics.

For instance, perhaps surprisingly, the share of lower-secondary teachers reporting to have participated in online courses or activities as part of their professional development is relatively similar at different levels of experience or teacher age (Figure 7). Participation is quite evenly distributed across ages and, if any, middle-aged teachers are more likely to engage. This may reflect that these teachers may be more at ease with teaching but also more likely to be curious about new forms of professional development, since they have already had the opportunity to engage in other types of professional development activities. At the same time, middle-aged teachers may be more likely to engage because the contents/programmes offered on line are more likely aligned to their needs to deepen subject or pedagogical content knowledge. In contrast, younger teachers often need more induction-type of professional learning for classroom teaching. As such, contents and opportunities offered online may be less suitable for inexperienced or entry-level teachers. For older teachers, while levels of participation are slightly smaller, these may reflect an overall lower level of participation in teacher professional development (since these teachers are likely to have already benefitted from substantial learning opportunities before) but also potentially insufficient skills to make the most of new technologies. In addition, more experienced teachers are more likely to have higher administration workload than others, and perhaps there is no or little content aligned to administrative learning needs on line.

Figure 6. Teachers' engagement in induction and professional development activities online, by country

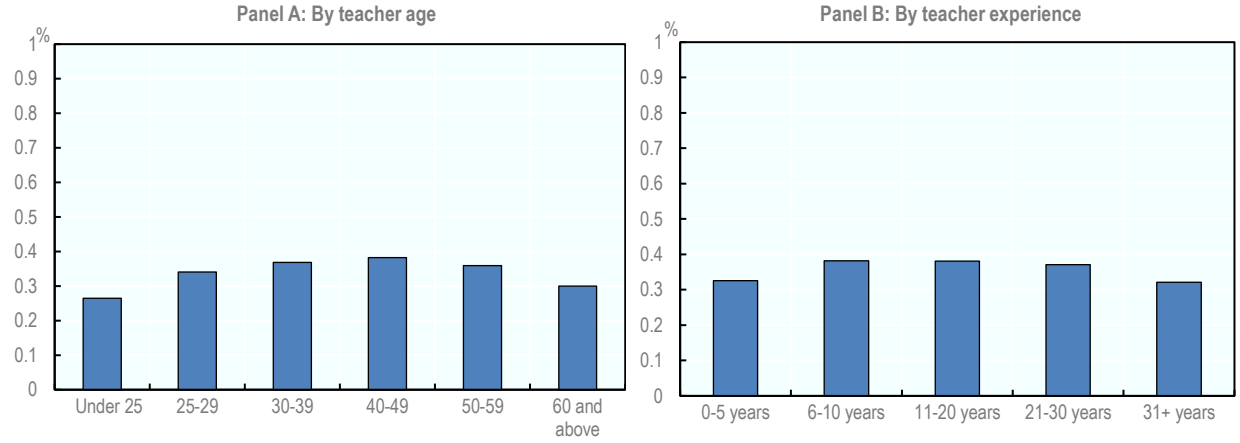
Share of lower-secondary teachers



Source: OECD calculations based on TALIS (2018).

Figure 7. Teachers' participation in online courses/seminars for professional development, by age and experience

Share of lower-secondary teachers



Source: OECD calculations based on TALIS (2018).

Participation rates in online professional development also appear to be evenly distributed across teachers working in rural and urban areas, although in Mexico, Spain and the United States- countries that also display high levels of participation in online professional development- teachers from rural schools are more likely to engage in online forms of professional development than those from cities (Figure 8). While on average across OECD countries, similar shares of teachers from different subjects engage in online courses or seminars, participation is significantly higher among science teachers in France, Sweden and the United States, whereas modern languages teachers are significantly more likely to participate in such activities in England and New Zealand.

On the contrary, the share of disadvantaged students in the school or reported shortages that hinder the provision of quality instruction do not appear to shape teachers' participation in online courses or seminars. Nor is participation influenced by teachers reporting specific barriers to professional development (although it is important to note that teacher report general barriers to professional development and not barriers linked to a specific type of professional development activity). Participation is also evenly distributed across teachers of different subjects, and is it is also similar for primary, lower-secondary and upper-secondary teachers in those countries where data is available at all education levels in TALIS (2018).

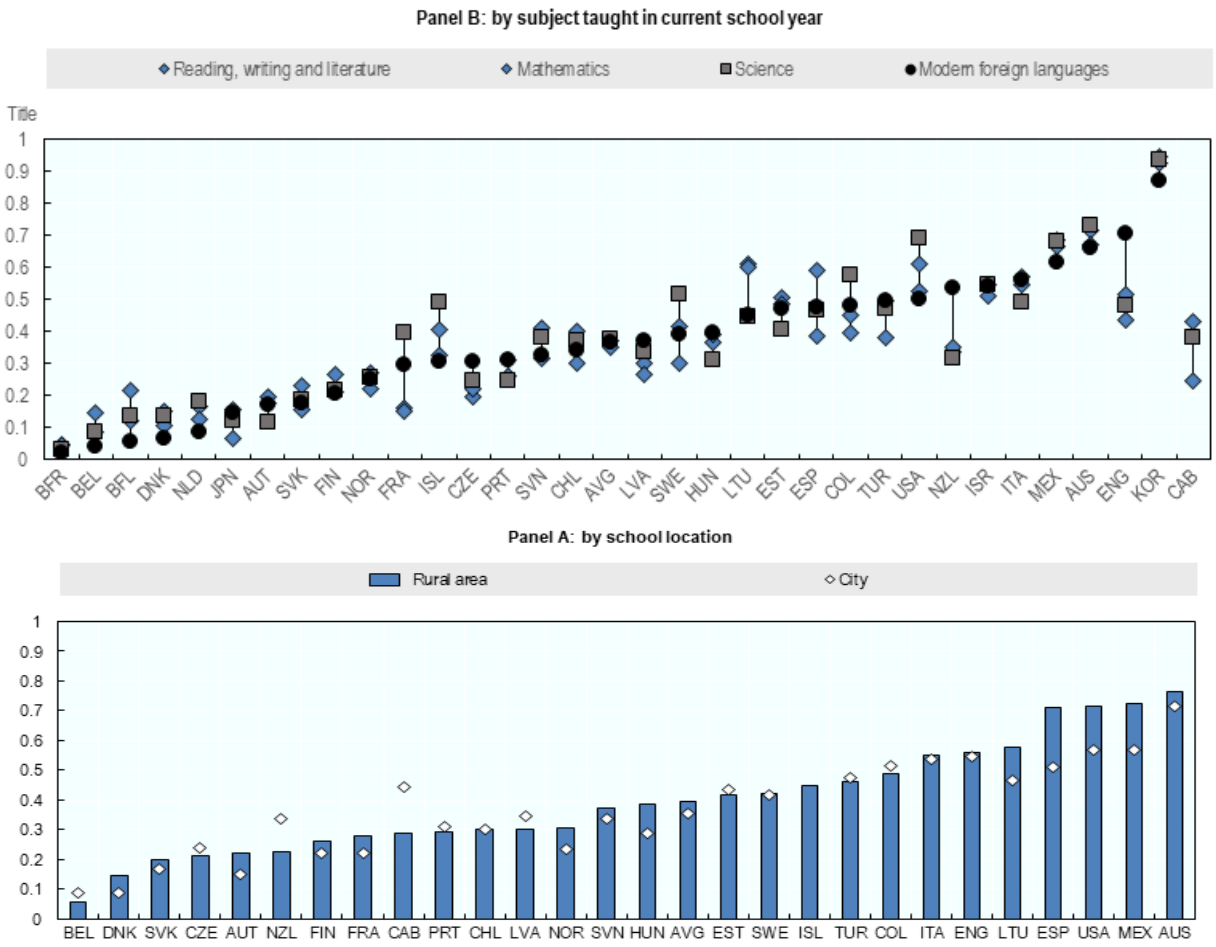
MOOC data suggest that teachers are over-represented among MOOC learners (Seaton, Coleman and Daries, 2014[8]). However, there is wide variability within the teaching profession, and data from TALIS suggests that the vast majority of teachers do not engage in online professional development. Teachers who participate in online courses/ seminars are more likely to engage in other types of professional development activities as well (Figure 9), suggesting a potentially higher readiness to learn and in particular, with new technologies, than teachers who do not engage in these forms of training. In addition, teachers who participate in online courses/ seminars are particularly more likely to have also participated in networks of teachers as part of their professional development, perhaps through online communities. Around 54% of lower-secondary teachers who had engaged in online professional development had participated in networks of teachers, in contrast to 40% among those who had not participated in online professional development. Participation in teacher networks has been found to be more effective for teacher learning

than more traditional forms of professional development (courses or seminars) and digitalisation offers novel opportunities for teachers to engage in such impactful forms of learning.

These figures reflect that engagement in online forms of professional development are likely to be a combination of teachers' own motivation and curiosity towards such forms of learning as well as of the wider provision or spread at the system-level of such forms. Teachers who engage in such forms are likely to be more motivated, display higher readiness to learn or be more curious about learning activities unfolded online. Evidence from Spain, on a MOOC initiative supported by the government for teacher professional development supports these hypotheses (Castaño-Muñoz et al., 2018[42]). In Spain, teachers generally found information on MOOCs while going on line for their own purposes or based on their personal contexts. Few reported to obtain information about MOOCs from their colleagues, in a professional context. At the same time, in countries with high levels of engagement in online forms of professional learning, the provision of such activities may be organised more systematically or teachers may receive more incentives and/or support to engage.

Figure 8. Teachers' participation in online courses/seminars for professional development, by school location and subject taught

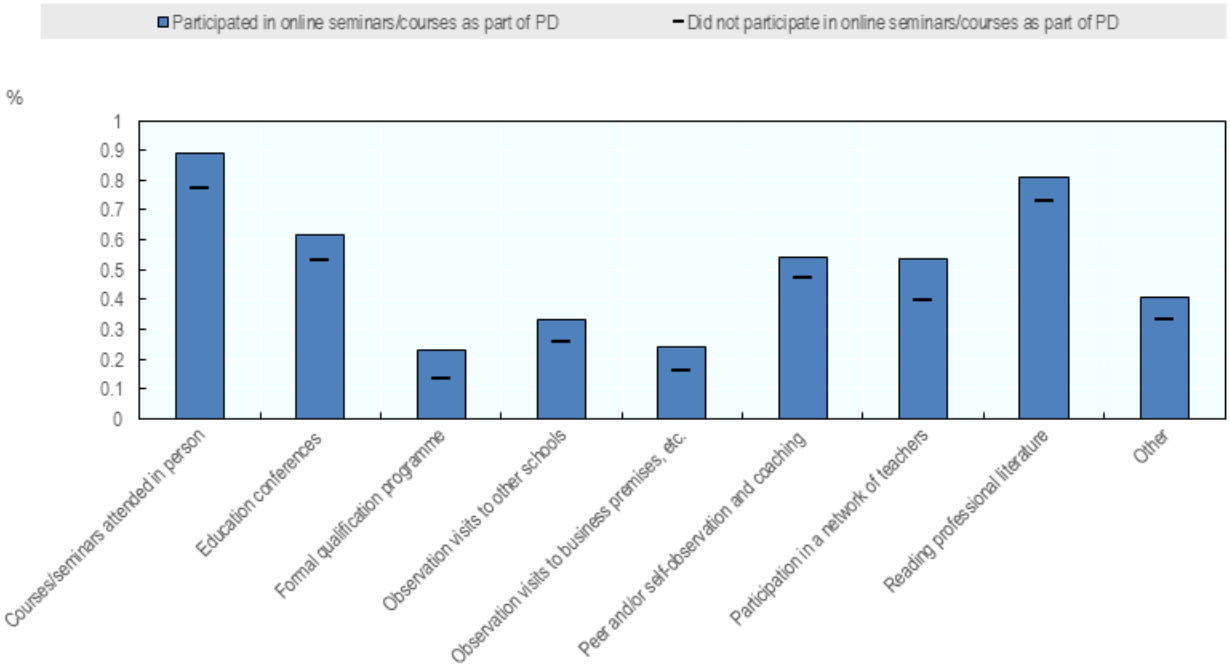
Share of lower-secondary teachers



Source: OECD calculations based on TALIS (2018).

Figure 9 Participation in other professional development activities, by engagement in online courses/seminars

Share of lower-secondary teachers having participated in each type of professional development (among those who engaged or not in online seminars/courses)



Source: OECD calculations based on TALIS (2018).

References

Alpert, W., K. Couch and O. Harmon (2016), "A Randomized Assessment of Online Learning", *American Economic Review: Papers & Proceedings*, Vol. 106/5, pp. 378-382, http://dx.doi.org/10.1257/aer.p20161057. [29]

Beach, P. (2017), "Self-directed online learning: A theoretical model for understanding elementary teachers' online learning experiences", *Teaching and Teacher Education*, Vol. 61, pp. 60-72, http://dx.doi.org/10.1016/j.tate.2016.10.007. [24]

Bettinger, E. et al. (2017), "Virtual Classrooms: How Online College Courses Affect Student Success †", *American Economic Review*, Vol. 107/9, pp. 2855-2875, http://dx.doi.org/10.1257/aer.20151193. [28]

Bulman, G. and R. Fairlie (2016), "Technology and Education: Computers, Software, and the Internet", in *Handbook of the Economics of Education*, http://dx.doi.org/10.1016/B978-0-444-63459-7.00005-1. [26]

Castaño-Muñoz, J. et al. (2018), "Who is taking MOOCs for teachers' professional development on the use of ICT? A cross-sectional study from Spain", *Technology, Pedagogy and Education*, Vol. 27/5, pp. 607-624, http://dx.doi.org/10.1080/1475939X.2018.1528997. [42]

Choi, D. and P. Morrison (2014), "Learning to get it right: understanding change processes in professional development for teachers of English learners", *Professional Development in Education*, Vol. 40/3, pp. 416-435, http://dx.doi.org/10.1080/19415257.2013.806948. [22]

Class Central (2019), *By The Numbers: MOOCs in 2019 — Class Central*, https://www.classcentral.com/report/mooc-stats-2019/ (accessed on 13 December 2019). [32]

Cranefield, J. and P. Yoong (2009), "Crossings: Embedding personal professional knowledge in a complex online community environment", *Online Information Review*, Vol. 33/2, pp. 257-275, http://dx.doi.org/10.1108/14684520910951203. [14]

Dash, S. et al. (2014), "Impact of Online Professional Development or Teacher Quality and Student Achievement in Fifth Grade Mathematics", *Journal of Research on Technology in Education*, Vol. 45/1, pp. 1-26, http://dx.doi.org/10.1080/15391523.2012.10782595. [21]

Davis, D. et al. (2017), "Follow the Successful Crowd: Raising MOOC Completion Rates through Social Comparison at Scale *", http://dx.doi.org/10.1145/3027385.3027411. [33]

Desimone, L. (2009), "Improving Impact Studies of Teachers' Professional Development: Toward Better Conceptualizations and Measures", *Educational Researcher*, Vol. 38/3, pp. 181-199, http://dx.doi.org/10.3102/0013189X08331140. [6]

Dooner, A., D. Mandzuk and R. Clifton (2008), "Stages of collaboration and the realities of professional learning communities", *Teaching and Teacher Education*, Vol. 24/3, pp. 564-574, http://dx.doi.org/10.1016/j.tate.2007.09.009. [17]

Escueta, M. et al. (2017), "Education Technology: An Evidence-Based Review", http://www.nber.org/papers/w23744. [25]

Goodman, J., J. Melkers and A. Pallais (2019), "Can online delivery increase access to education?", *Journal of Labor Economics*, Vol. 37/1, pp. 1-34, http://dx.doi.org/10.1086/698895. [31]

Grundke, R. et al. (2017), "Skills and global value chains: A characterisation", *OECD Science, Technology and Industry Working Papers*, No. 2017/05, https://dx.doi.org/10.1787/cdb5de9b-en. [40]

Hanushek, E., M. Piopiunik and S. Wiederhold (2014), "The value of smarter teachers: International evidence on teacher cognitive skills and student", *NBER Working Paper Series*, No. 20727, http://www.nber.org/papers/w20727 (accessed on 13 April 2018). [39]

Joyce, T. et al. (2015), "Does classroom time matter?", *Economics of Education Review*, Vol. 46, pp. 64-77, http://dx.doi.org/10.1016/j.econedurev.2015.02.007. [30]

Karlsson, N. and A. Godhe (2016), "Creating a Community Rather than a Course--Possibilities and Dilemmas in a MOOC.", *Education Sciences*, Vol. 6. [11]

Lantz-Andersson, A., M. Lundin and N. Selwyn (2018), "Twenty years of online teacher communities: A systematic review offormally-organized and informally-developed professional learning groups", *Teaching and Teacher Education*, Vol. 75, pp. 302-315. [15]

Littenberg-Tobias, J., R. Slama and J. Reich (2020), "Large-Scale Learning for Local Change: The Challenge of MOOCs as Educator Professional Learning", http://dx.doi.org/10.35542/OSF.IO/QRWBE. [10]

Macià, M. and I. García (2016), *Informal online communities and networks as a source of teacher professional development: A review*, Elsevier Ltd, http://dx.doi.org/10.1016/j.tate.2016.01.021. [13]

Matzat, U. (2013), "Do blended virtual learning communities enhance teachers' professional development more than purely virtual ones? A large scale empirical comparison", *Computers and Education*, Vol. 60/1, pp. 40-51, http://dx.doi.org/10.1016/j.compedu.2012.08.006. [20]

Matzat, U. (2010), "Reducing Problems of Sociability in Online Communities: Integrating Online Communication With Offline Interaction", *American Behavioral Scientist*, Vol. 53/8, pp. 1170-1193, http://dx.doi.org/10.1177/0002764209356249. [19]

McConnell, T. et al. (2013), "Virtual Professional Learning Communities: Teachers' Perceptions of Virtual Versus Face-to-Face Professional Development", *Journal of Science Education and Technology*, Vol. 22/3, pp. 267-277, http://dx.doi.org/10.1007/s10956-012-9391-y. [18]

OECD (2020), *Digital strategies in education - Exploring education policies on digital technologies*. [43]

OECD (2020), *ICT Access and Usage by Households and Individuals database*, https://stats.oecd.org/Index.aspx?DataSetCode=ICT_HH2. [37]

OECD (2020), *TALIS 2018 Results (Volume II): Teachers and School Leaders as Valued Professionals*, TALIS, OECD Publishing, Paris, https://dx.doi.org/10.1787/19cf08df-en. [44]

OECD (2019), *Education at a Glance 2019: OECD Indicators*. [38]

OECD (2019), *Going Digital: Shaping Policies, Improving Lives*, OECD Publishing, Paris, https://dx.doi.org/10.1787/9789264312012-en. [36]

OECD (2019), *OECD Skills Outlook 2019 : Thriving in a Digital World*, OECD Publishing, Paris, https://dx.doi.org/10.1787/df80bc12-en. [3]

OECD (2019), *TALIS 2018 Results (Volume I): Teachers and School Leaders as Lifelong Learners*, TALIS, OECD Publishing, Paris, https://dx.doi.org/10.1787/1d0bc92a-en. [12]

OECD (2018), *TALIS Teacher Questionnaire*. [41]

OECD (2015), *E-Learning in Higher Education in Latin America*, Development Centre Studies, OECD Publishing, Paris, https://dx.doi.org/10.1787/9789264209992-en. [45]

Patterson, R. (2018), "Can behavioral tools improve online student outcomes? Experimental evidence from a massive open online course", *Journal of Economic Behavior and Organization*, Vol. 153, pp. 293-321, http://dx.doi.org/10.1016/j.jebo.2018.06.017. [34]

Philipsen, B. et al. (2019), "Improving teacher professional development for online and blended learning: a systematic meta-aggregative review", *Educational Technology Research and Development*, Vol. 67/5, pp. 1145-1174, http://dx.doi.org/10.1007/s11423-019-09645-8. [5]

Prestridge, S. and J. Tondeur (2015), "Exploring Elements That Support Teachers Engagement in Online Professional Development", *Educ. Sci.*, Vol. 5, pp. 199-219, http://dx.doi.org/10.3390/educsci5030199. [4]

Qian, Y. et al. (2018), "Who Needs What: Recommendations for Designing Effective Online Professional Development for Computer Science Teachers", *Journal of Research on Technology in Education*, Vol. 50/2, pp. 164-181, http://dx.doi.org/10.1080/15391523.2018.1433565. [7]

Reich, J. and J. Ruipérez-Valiente (2019), *The MOOC pivot*, American Association for the Advancement of Science, http://dx.doi.org/10.1126/science.aav7958. [9]

Reimers, F. and A. Schleicher (2020), *Schooling disrupted, schooling rethought. How the Covid-19 pandemic is changing education*. [1]

Seaton, D., C. Coleman and J. Daries (2014), "Teacher Enrollment in MIT MOOCs: Are We Educating Educators?", *SSRN Electronic Journal*, http://dx.doi.org/10.2139/ssrn.2515385. [8]

Seo, K. and Y. Han (2013), "Online teacher collaboration: A case study of voluntary collaboration in a teacher-created online community", *KEDI journal of educational policy*, Vol. 10/2, pp. 221-242, https://www.researchgate.net/publication/287315935_Online_teacher_collaboration_A_case_study_of_voluntary_collaboration_in_a_teacher-created_online_community (accessed on 3 June 2020). [16]

Vuorikari, R. (2018), "Innovating Professional Development in Compulsory Education Examples and cases of emerging practices for teacher professional development", *JRC Technical Reports*, http://dx.doi.org/10.2760/734136. [2]

Xu, D. and S. Jaggars (2016), "The Journal of Higher Education Performance Gaps between Online and Face-to-Face Courses: Differences across Types of Students and Academic Subject Areas", http://dx.doi.org/10.1080/00221546.2014.11777343. [27]

Yeomans, M. and J. Reich (2017), "Planning Prompts Increase and Forecast Course Completion in Massive Open Online Courses", http://dx.doi.org/10.1145/3027385.3027416. [35]

Yurkofsky, M., S. Blum-Smith and K. Brennan (2019), "Expanding outcomes: Exploring varied conceptions of teacher learning in an online professional development experience", *Teaching and Teacher Education*, Vol. 82, pp. 1-13, http://dx.doi.org/10.1016/j.tate.2019.03.002. [23]