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**PROPOSAL FOR A 2018 ITTEL-TALIS LINK THROUGH THE TEACHER KNOWLEDGE SURVEY**

*This document presents a proposal and rationale for the value-added benefits of linking the CERI/ITEL Teacher Knowledge Survey with TALIS in 2018 in order to enhance the analytical capacity of TALIS. The proposal is in response to the OECD's continued efforts to align its education surveys conceptually, methodologically, and operationally so that they form part of a coherent and strategic Programme of Work that serves participating countries most effectively and provides the best possible value for money.*

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## **PROPOSAL FOR A 2018 ITEL-TALIS LINK THROUGH THE *TEACHER KNOWLEDGE SURVEY***

### **Introduction**

1. This paper is in response to the OECD's continued efforts to align its education surveys conceptually, methodologically, and operationally so that they form part of a coherent and strategic Programme of Work that serves participating countries most effectively and provides the best possible value for money. This includes innovative measurement work being developed in CERI, such as the *ITEL Teacher Knowledge Survey* (ITEL-TKS). This paper presents a proposal and rationale for the value-added benefits of linking the ITEL-TKS with TALIS in 2018.

2. In brief, linking the ITEL-TKS to TALIS 2018 would permit EDU to both continue to innovate within the TALIS programme, and also, very importantly, enhance the analytical capacity of TALIS. One way to innovate in TALIS is to begin to include objective measures of teachers' knowledge of instructional practices as a way to more effectively measure impact on learning. Within CERI, the ITEL-TKS is developing a set of instruments for assessing teachers' pedagogical knowledge. Whereas TALIS is a self-report survey, the ITEL-TKS is an assessment of teachers' knowledge of pedagogy. The ITEL-TKS survey is not meant to assess textbook knowledge, but rather how pedagogical knowledge is implemented in practice (akin to how PISA assesses 15-year-olds' skills in applying knowledge of math, reading, and science). The aim would be to link teachers' self-reported use of instructional practices (as collected by TALIS) to an assessment of teachers' underlying knowledge of effective instructional and learning processes (as collected by ITEL-TKS). In other words, teachers' self-reported practices can be linked analytically to an objective measure of their assessed pedagogical knowledge. Linking ITEL-TKS and TALIS through the same sample of ISCED 2 in-service teachers would offer countries more analytical sophistication for examining the learning outcomes of initial teacher education and the impact of professional development.

3. In fact, the value-added contribution of the ITEL-TKS is in developing indicators to measure learning outcomes of initial teacher education and the professional competences of expert teachers. This is so we can better understand quality teaching and how to better train new teachers and develop more effective professional development programmes. In what follows, we describe in more detail how the two surveys can be linked conceptually, methodologically, and operationally. We begin with the rationale and value-added benefits of such a link.

### **Rationale for the Value-Added Benefits of an ITEL-TALIS Link**

4. To date, the TALIS survey has been implemented twice (in 2008 and 2013), with a third implementation scheduled for 2018. The purpose of TALIS is to collect cross-national data about the learning environments and working conditions of teachers. This is a self-report survey targeting teachers of lower-secondary (ISCED 2) education and their school leaders. TALIS 2013 offered the option to implement the survey in ISCED 1 and 3. It is expected that TALIS 2018 will have a similar content focus as TALIS 2013, with some additional questions to enable further investigations. Beyond 2018, TALIS will be carried out on a six-yearly basis, in co-ordination with PISA.

5. The policy relevance of TALIS is in providing countries with data to answer questions related to teachers' professional environment and working conditions, school leadership, and teachers' perceptions of their effectiveness. For example, TALIS asks questions such as how well teachers feel prepared to face the diverse challenges in schools, how appraisal and feedback systems can efficiently support good teaching and teachers' professional development, how school leadership can be strengthened to improve schools

and students' achievement, and how policy-makers can ensure that resources invested in teachers' professional development will have a positive impact on teachers' work.

6. A strength of TALIS is that it captures teachers' own voice. For example, TALIS asks teachers about their sense of self-efficacy, job satisfaction, and whether they feel valued in society. Such self-reported data is important for countries to better understand teachers' lived experiences. TALIS also asks teachers about their instructional practices, and in particular, their use of non-traditional teaching practices, such as problem-based learning, ICT, and collaborative teaching. These, too, are self-reported data.

7. One way to innovate in TALIS is to begin to include objective measures of teachers' knowledge of instructional practices as a way to more effectively measure impact on learning. Of particular relevance for improving student achievement is teachers' professional competence, and especially teachers' pedagogical knowledge, which is a key component of their professional competence. Recent empirical studies are beginning to reveal that a strong foundation in pedagogical knowledge is related to better instructional quality and higher student achievement. (For a review of this research, see Annex A.) Moreover, some have claimed that teachers' self-reported use of instructional practices do not accurately reflect what teachers actually do in classrooms. This is an empirical question, and one to which the ITEL-TKS can contribute. Before we describe how linking TALIS and the ITEL-TKS in 2018 can enhance the analytical capacity of both surveys, we begin with an overview of the ITEL-TKS.

### **Overview of the ITEL Teacher Knowledge Survey**

8. Within CERI, the ITEL *Teacher Knowledge Survey* is developing a set of instruments for assessing teachers' pedagogical knowledge with a pilot study scheduled for implementation in 2016 for validating the instruments. To get a better sense of the analytical potential of linking the ITEL-TKS to TALIS, we provide below an overview of the policy objectives of the *Teacher Knowledge Survey* and how these are transformed into research questions and an assessment framework. Annex A gives a more detailed review of the policy issues and research questions.

#### ***Policy Issue #1: How can we improve pedagogy for more successful learning?***

9. To answer this question, the ITEL-TKS Survey will measure the nature of teachers' pedagogical knowledge and the knowledge dynamics in the teaching profession. 'Pedagogical knowledge' refers to the specialised knowledge of teachers for creating effective teaching and learning environments for all students. Teachers will respond to questions that measure their knowledge of student learning as it applies to the teaching of '21st century skills,' which include not only knowledge of how to teach for deep learning, but also how to teach critical thinking, creativity, problem-solving, collaboration and communication. Survey items are developed based on recent research in the various fields that study the science of learning. An understanding of what teachers know and how to implement these pedagogies will provide countries with information on how to improve pedagogy for more successful learning. The assessment framework is given in Table 1 below.

#### ***Policy Issue #2: How can we improve teacher education for more successful teaching?***

10. To answer this question, the survey will collect information on the extent and scope of the learning opportunities provided to teachers during initial teacher education and in professional development, and this information will be related to teachers' pedagogical knowledge. For example, questions will target whether teachers have had the opportunity to learn the various topics that make up the dimensions of the assessment framework. A better understanding of how both theoretical and practical knowledge relates to learning opportunities will provide countries with information on how to improve teacher education for both pre-service and in-service teachers.

***Policy Issue #3: How can we improve selection, retention, and professional development of teachers?***

11. To address this question, our survey will investigate how teachers' pedagogical knowledge relates to their professional competence. For example, there is no doubt that professional competence requires more than just cognitive knowledge (i.e., pedagogical knowledge), but also intra- and inter-personal competences. For example, research shows that effective teachers are more likely to have higher self-efficacy. But self-efficacy does not sufficiently explain retention in the profession. This is because teacher motivation is a complex construct which research is now beginning to better understand. Therefore, our ITTEL-TKS study will also measure teachers' affective-motivational characteristics in order to begin to develop a comprehensive framework of teachers' professional competence (this is further explained below; see Figure 3). A better understanding of teachers' professional competence will provide countries with information for better selection, retention, and further development of teachers.

***Assessment Framework***

12. Our ITTEL-TKS assessment framework is derived from the empirical research on effective teaching practices that impact on student learning (see Table 1). Based on this literature, the assessment framework captures what the international literature agrees on are the 3 major dimensions of teachers' pedagogical knowledge (Instructional Process, Learning Process, and Assessment). Each major dimension is further specified into sub-dimensions. Items for assessing pedagogical knowledge have been developed for each sub-dimension, as follows:

- Instructional Process: Teaching methods, planning and structuring a lesson, and classroom management.
- Learning Process: Individual cognitive and motivational-affective dispositions, learning and development, and classroom heterogeneity and adaptive teaching.
- Assessment: Diagnosis principles, evaluation procedures, and data use and research literacy.

13. To capture differences in the quality of pedagogical knowledge, a modified version of Anderson and Krathwohl's (2001) model of cognitive processing has been adopted to capture variations in cognitive demands that typically differentiate between easier items (e.g., recall of facts) and harder items (e.g., items requiring understanding or analysing information). Cognitive demand can also capture variations in cognitive processing demands that typically differentiate between novice and expert teachers. For instance, research on teacher expertise shows that expert teachers are better at applying their knowledge (i.e., situated or procedural knowledge) than novice teachers because of the higher processing required of novice teachers until the knowledge becomes more automatic. Items have been developed for both levels of cognitive demand, or whether the information requires (1) recall or (2) understanding/analysis.

14. The ITTEL-TKS is an assessment of teachers' knowledge of, and how to apply that knowledge, to pedagogy. The survey is not meant to assess textbook knowledge, but rather how pedagogical knowledge is implemented in practice (akin to how PISA assesses 15-year-olds' skills in applying knowledge of math, reading, and science). Research shows that a scientific and theoretical foundation is necessary for successful implementation in practice. Therefore, our survey captures both academic learning, for example, theoretical and scientific knowledge of pedagogy learned in initial teacher education and professional development, as well as knowledge learned from practice, for example, experiential and work-based knowledge gained through classroom teaching and professional learning communities. This distinction is captured in our assessment framework by whether the knowledge is (1) practice-based or (2) theoretical/scientific.

15. Our assessment framework is given in Table 1 below. The content of the assessment items target key competencies for ‘21<sup>st</sup> century’ learning. That is, items have been developed to assess teachers’ knowledge of instructional practices for teaching social-emotional skills, creativity, critical thinking, deep learning, problem-solving, among many others. A snapshot of a few of the concepts that will be assessed is given in Table 1 below. Two sample items are given in Figures 1 and 2. Figure 1 is a sample ITEL-TKS item meant to capture teachers’ understanding of student motivation. Figure 2 is a practice-based item which assesses teachers’ knowledge of how to most effectively teach for deep learning.

**Table 1. Assessment Framework for the *Teacher Knowledge Survey***

Dimensions of Pedagogical Knowledge	Sub-Dimensions of Pedagogical Knowledge	Cognitive Demand		Type of Knowledge	
		Recall	Understand/Analyse	Practice-Based	Theoretical/Scientific
<b>Instructional Process</b>	Teaching Methods				
	Planning & Structuring a Lesson				
	Classroom Management				
<b>Learning Process</b>	Individual Cognitive & Motivational-Affective Dispositions				
	Learning & Development				
	Classroom Heterogeneity & Adaptive Teaching				
<b>Assessment</b>	Diagnosis Principles				
	Evaluation Procedures				
	Data Use & Research Literacy				

**Figure 1. Sample item for assessing theoretical/scientific knowledge**

Which of the following cases represents an example of intrinsic motivation, and which represents an example of extrinsic motivation? *Check one box in each row.*

**A student studies in preparation for a test in mathematics because he/she...**

- A. Expects a reward for a good grade.
- B. Wants to avoid the consequences of a bad grade.
- C. Is interested in problems of mathematics.
- D. Does not want to disappoint his/her parents.
- E. Wants to maintain his/her relative rank in the class.

**Intrinsic motivation**

**Extrinsic motivation**

☐

☐

☐

☐

☐

☐

☐

☐

☐

☐

**Figure 2. Sample item for assessing practice-based knowledge**

A teacher is planning to teach a history unit which will contain many important dates and events to remember. This information will be on the next test which is going to contain 5 essay questions. Which of the following is best at helping students memorize historical facts for use in a written exam?		
A.	Developing lessons that link the new information to students' prior knowledge.	<input type="checkbox"/>
B.	Assigning additional readings for students to complete on their own.	<input type="checkbox"/>
C.	Taking turns in class while each student recites dates and events.	<input type="checkbox"/>
D.	Assigning homework where students repeatedly copy the historical details.	<input type="checkbox"/>

### How an ITEL-TALIS Link can Enhance the Analytical Capacity of TALIS

16. As mentioned previously, the aim would be to link teachers' self-reported use of instructional practices (as collected by TALIS) to an assessment of teachers' underlying knowledge of effective instruction for successful learning (as collected by the *Teacher Knowledge Survey*). While the content of TALIS 2018 remains to be developed, we can use TALIS 2013 to provide an example of how linking with the ITEL-TKS would enhance the analytical capacity of TALIS. For example, TALIS 2013 asked teachers to report the extent to which they are able to or use the following practices:

- Crafting good questions for students
- Motivating students who show low interest in school work
- Making expectations about learning goals and student behaviour clear
- Helping students think critically
- Calming a student who is disruptive or noisy
- Using a variety of assessment strategies
- Implementing alternative instructional strategies
- Assigning students to work in small groups to come up with a joint solution to a problem or task
- Giving different work to the students who have difficulties learning and/or to those who can advance faster
- Assigning students to work on projects that require at least one week to complete

17. Each of the above is a self-report item with usually four response options to indicate ability to use or frequency of use. The purpose is for countries to get a sense of the extent these practices are used and, in comparison with other countries, get a sense of how such practices relate to other teacher- and school-level characteristics, such as the school climate, access to professional development, beliefs about teaching methods, sense of self-efficacy, job satisfaction, to name a few.

18. Linking TALIS with the ITEL-TKS would allow countries to also assess the 'quality' of teachers' instructional practices by investigating teachers' knowledge of pedagogy and how to effectively apply pedagogical practices for successful learning. Using the sample item in Figure 1 as an example, the item can be linked analytically to the TALIS item asking teachers to report the extent to which they are able to "motivate students who show low interest in school work." In this particular case, we can analyse whether teachers who report difficulty in motivating students' also perform poorly on their assessed knowledge of student motivation. This information is useful for countries and school leaders to learn about

the quality of their teachers' pedagogical knowledge and where to direct resources for professional development. For example, understanding student motivation is important for teachers to know in order to keep students engaged in learning, but also for being able to identify students with motivational problems in order to intervene.

### **ITEL-TKS Instruments**

19. To get a sense of the analytic potential of linking the ITEL-TKS to TALIS, the following are the set of instruments being developed for the *Teacher Knowledge Survey* for piloting in 2016:

- An instrument for assessing teachers' general pedagogical knowledge (as described above).
- An instrument for measuring 'opportunities to learn' in initial teacher education and professional development to investigate how quality of learning opportunities relate to assessed performance on pedagogical knowledge. This addresses our Policy Issue #2.
- An instrument for measuring teacher motivation characteristics to investigate underlying intra- and inter-personal factors driving professional competence in teaching and dispositions for retention in the profession. This addresses our Policy Issue #3.
- An instrument to measure teachers' self-reported instructional quality in order to validate assessed pedagogical knowledge.

20. Each of the above instruments are currently under development with completion expected by the end of 2015.

### **Conceptual Alignment and Coherence**

21. Linking two independent surveys requires that the two projects be aligned conceptually in order to permit the linked analyses to have explanatory power. The conceptual framework underlying our *Teacher Knowledge Survey* is positioned within a larger (and holistic) framework of teachers' professional competence, and as such, is already conceptually linked to TALIS (and other EDU surveys, described below). Figure 3 below depicts the conceptual framework.

22. Our ITEL-TKS framework is founded on the basis that high-quality initial teacher education is an important first step for teachers to acquire the right set of foundational knowledge and skills through high-quality learning opportunities. Teachers' professional competence is part of a continuous process of professionalization, which also involves continuous professional development and the regular updating of teachers' knowledge and skills. High-quality learning opportunities interact with and develop teachers' cognitive and motivational-affective (intra- and inter-personal) competencies. Teachers' cognitive and motivational-affective competencies drive the decision-making required for effective instruction through high-quality teaching practices (i.e., applying theoretical knowledge to practice). Our conceptual framework is based on the empirical and conceptual literature that integrates research in pedagogical knowledge, instructional and learning processes, and the inter- and intra-personal competences underlying quality teaching (e.g., Blömeke & Delaney, 2012; Blömeke, Felbrich, Müller, Kaiser, & Lehmann, 2008; Blömeke, Gustafsson, & Shavelson, 2015; Seidel, Stürmer, Blomberg, Kobarg, & Schwindt, 2011; Sherin & van Es, 2009; van Es, 2009; van Es & Sherin, 2008).

23. Figure 3 depicts how the ITEL-TKS and TALIS surveys are related conceptually. The three interrelated circles depicting teachers' cognitive and intra- and inter-personal competencies are being measured via the ITEL-TKS instruments (teachers' pedagogical knowledge and teacher motivation). The

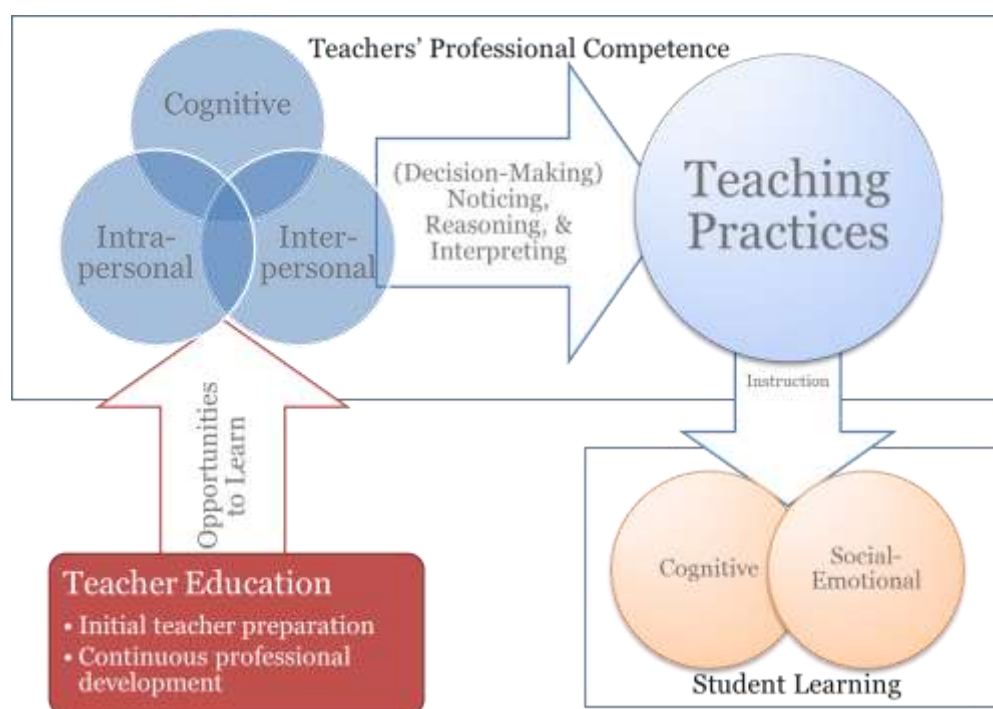


ITEL-TKS survey will also be measuring the quantity and quality of pedagogy content in initial teacher education and professional development. Some ITEL-TKS items will also be able to capture teachers' decision-making capacity. As discussed above, the TALIS survey asks teachers about their ability to and the extent to which they use various instructional practices. In this way, the two surveys are conceptually coherent and aligned.

24. Our ITEL-TKS framework has been purposefully designed to be holistic in order to connect teaching to learning, which is the ultimate goal of improving education. Figure 3 also depicts how the ITEL-TKS can be linked with other large-scale surveys in EDU. For example, the ITEL-TKS can be linked to student learning as assessed by PISA. Additionally, the ITEL-TKS can be linked with the future longitudinal survey on assessing children's social and emotional skills (via the ESP project), as well as the future survey on Measuring Early Child Outcomes (via the ECEC project). In all these projects, an assessment of teachers' knowledge would be useful for better explaining student performance, as well as for learning where and how to direct resources for improving teacher education.

25. Within this conceptual framework, it is also possible to implement the ITEL-TKS instruments within the TALIS Video Study currently under development. This would enable countries to more fully understand how teachers' pedagogical knowledge is related to self-reported teaching practices and to observed teaching practices.

**Figure 3. Conceptual Framework of Teachers' Professional Competence for the *Teacher Knowledge Survey***



### Methodological and Operational Alignment

26. The ITEL *Teacher Knowledge Survey* has been purposefully designed to target ISCED 2 in order to allow for alignment with TALIS and PISA samples. The sampling framework for the ITEL-TKS survey is given in Annex B. Should there be linking with TALIS in 2018, the sampling would be restricted to in-service teachers. In other words, we are not proposing to change the TALIS sampling framework, but rather to provide the value-added benefit of including the ITEL-TKS instruments within TALIS's current

sampling framework. This would offer countries more analytical sophistication to get a better understanding of how pedagogical knowledge is related to practice. It should be noted that it would not be analytically possible to conduct teacher-level analyses; all analyses would be conducted at the school- and country-level.

27. Data collection for the ITEL-TKS is scheduled to begin in February 2016. As development and validation of the survey would be completed by the end of 2016, the instruments would be available for the TALIS field trial in 2017. A timeline of activities is given in the table below.

28. In terms of operations, countries may wish to implement the ITEL-TKS in TALIS 2018 as an optional component (e.g., similar to how ISCED 1 and 3 were optional components in TALIS 2013). However, as these are two separate surveys, the preferred method is to link the ITEL-TKS survey to TALIS as an independent survey, rather than implemented as an optional component of TALIS 2018. On its own, the ITEL-TKS will take about 60-90 minutes to complete, which will have consequences for survey fatigue and response rates. In particular as the ITEL-TKS is an assessment, survey fatigue and data contamination should be minimized as much as possible as this would have consequences on measured performance. It would not be possible to simply rotate administration of the ITEL-TKS and TALIS instruments because TALIS is not implemented under supervised conditions and the data might become contaminated or response rates affected by having teachers inform one another of the assessment component.

29. Should an ITEL-TALIS 2018 link become a reality, issues of data contamination and survey fatigue would need to be discussed and resolved in consultation with the Technical Advisors for the respective surveys.

**Table 2. Teacher Knowledge Survey Work Schedule 2015-2016**

Activity	Completion Date
Item development (by Secretariat and experts)	30 Sep 2015
Finalization of sampling framework	31 Oct 2015
Review of draft items and focus groups by countries	15 Nov 2015
Review meeting with experts and countries (in Paris)	30 Nov-1 Dec 2015
Finalizing instruments (by Secretariat and experts)	15 Dec 2015
Finalizing translation (by countries)	15 Jan 2016
Implementing and testing instruments online	31 Jan 2016
Data collection (through Secretariat)	February 2016
Data analysis and report writing (by Secretariat)	Mar-Sept 2016
Formatting of draft International Report	October 2016
Review of draft International Report by countries	November 2016
Release of International Report	April 2017

### **Long Term Strategic Development of the ITEL *Teacher Knowledge Survey***

30. The ITEL *Teacher Knowledge Survey* project is designed to meet two purposes: (1) to address relevant policy issues of immediate concern to countries; and (2) to test theoretical hypotheses that can help explain the observed relationships. In other words, this project is also a research study in which the survey instruments will be used to test our underlying theories of teachers' professional competence, with the purpose to further defining and developing our conceptual understandings with each subsequent implementation of the instruments. For example, with each subsequent implementation cycle, various theoretical dimensions of teacher motivation can be measured against observed variations in pedagogical knowledge with the goal to building a more refined conceptual framework of the factors that underlie competent teaching. In this way, we can better support countries with evidence-based policy recommendations that are more likely to work.

31. The first implementation of the ITEL-TKS survey is purposefully designed to be small-scale and to focus resources on development and testing (i.e., validation) of the survey instruments in a few institutions per participating country. The next (and future) rounds of the survey will build on this first cycle and allow implementation on a larger scale. Moreover, this first cycle will give directions for which associations emerge as valid and interesting to look further into with a larger nationally representative sample. This is meant to keep implementation costs low while still maintaining a high degree of scientific rigor during development. As such, countries will still be able to gain valuable insights from participating in this first cycle because the study has been designed to include sufficient samples to permit technically-sound analyses that will allow for valid interpretations of the data.

32. This type of developmental work is possible within the CERI programme of work since the purpose of CERI is to bring new and innovative ideas to our Directorate-wide work in education. As a development project within CERI, we work directly with researchers who are experts in the area of teacher knowledge and teachers' professional competence and who are able to collaborate with us to pilot test the instruments in small samples. This enables us to test and validate instruments in a cost-efficient manner before deploying them in large-scale studies.

33. Irrespective of whether there will be an ITEL-TALIS link in 2018, the ITEL *Teacher Knowledge Survey* is being developed as a stand-alone and independent survey, with a proposal to the CERI GB for large-scale implementation in 2017-2018 and beyond. Future development of the survey will target ISCED 0, 1 and 3; we purposefully began with ISCED 2 to allow for linking possibilities in the short-term while we continue to develop our instruments for other ISCED levels. Future work is planned for development of instruments for assessing pedagogical content knowledge, for example, in math or science; development of screening instruments for identifying candidates who are likely to persist and those who are likely to withdraw from the profession; as well as longitudinal implementation to permit trend analyses for measuring growth in knowledge.

34. Our strategic focus is for all development of the ITEL-TKS survey to be 'modular' to allow for linking with other large-scale surveys in EDU, including PISA, the ESP assessment of children's social-emotional skills, the ECEC staff survey and the ECEC assessment of early learning outcomes, as well as the TALIS Video Study.

## ANNEX A: THE ITEL *TEACHER KNOWLEDGE SURVEY*

### Policy Context and Research Objectives

1. The ITEL *Teacher Knowledge Survey* is being developed to address three policy challenges: (1) How can we improve pedagogy for more successful learning? (2) How can we improve teacher education for more successful teaching, and in particular, how can we improve the learning outcomes of initial teacher education? (3) How can we improve the selection, retention, and professional development of teachers? To address these policy challenges, the *Teacher Knowledge Survey* is designed to collect data around the three research objectives we briefly describe next.

#### **Research Objective #1: What is the nature of teachers' pedagogical knowledge and what are the knowledge dynamics in the teaching profession?**

2. Teaching is a knowledge-rich profession and teachers possess highly-specialised knowledge. Pedagogical knowledge, that is, knowledge of teaching and learning, refers to the specialised body of knowledge of teachers for creating effective teaching and learning environments for each and all students. This knowledge would include, for example, knowledge of how to structure learning objectives, how to plan a lesson, how to evaluate a lesson; knowledge of effective use of allocated time and strategies for differentiated instruction; as well as knowledge of how to design tasks for formative assessment. The knowledge base would also include specialized knowledge of 'learning,' such as knowing how to facilitate learning given student characteristics that impact on effective learning, which would include, for example, students' prior knowledge, motivation, and ability levels (Blömeke, Paine, Houang, et al., 2008; König, Blömeke, Paine, Schmidt, & Hsieh, 2011; Shulman, 1986, 1987; Voss, Kunter, & Baumert, 2011). While it is acknowledged that pedagogical content knowledge is an important component of teacher knowledge, the specific focus of this phase of the ITEL project is on **general pedagogical knowledge**, that is, knowledge that can be used across different subject domains (as opposed to pedagogical content knowledge, which refers to the knowledge required for teaching of a specific subject, such as mathematics or science).

3. The pedagogical knowledge base is not static – for example, new knowledge emerges from research or is shared through professional communities. As professionals, teachers are expected to process and evaluate new knowledge relevant for their core professional practice and to regularly update their profession's knowledge base. Investigating the **knowledge dynamics** in the profession is one way to measure how knowledge flows in and out of the profession, and especially, how new knowledge is incorporated into the profession through learning opportunities in initial teacher education and professional development.

4. This issue is especially relevant in the learning environments of today's schools where classrooms are becoming more diverse and where teachers are expected to teach '21<sup>st</sup> century skills.' For example, as education systems are tasked with preparing students for the 21<sup>st</sup> century labour market, teachers are expected to teach '21<sup>st</sup> century skills.' These skills, generally understood to include a range of competencies such as problem-solving, critical thinking, collaboration, communication, and creativity, might require teachers to deviate from traditional teaching methods and to employ innovative teaching practices. For some countries, this might entail a re-skilling of the current teaching workforce and upgrading of the profession's knowledge base within teacher education institutions and through

professional communities. Understanding what the current knowledge base looks like will help determine whether and to what extent re-skilling is required.

5. New knowledge also emerges from research and this knowledge needs to be accessed, processed and evaluated, and transformed into knowledge for practice. For example, the interdisciplinary field of the ‘Science of Learning,’ which includes the field of Educational Neurosciences, has made huge progress in understanding how the human brain processes, encodes, and retrieves information. Understanding how the brain works can inform teachers’ pedagogical practice, for example, by designing and structuring lessons that enable ‘deep learning’ (rather than surface learning) or by adapting lessons for individual students’ prior knowledge, motivation, and ability levels. In this respect, teacher educators can be expected to have more current knowledge, and especially the capacity to transform research knowledge into practical knowledge, as this is how findings from learning research can best be incorporated into the profession. A measure of the knowledge dynamics will help determine how and to what extent the latest scientific research on learning has been incorporated into the profession.

6. The purpose of the *ITEL Teacher Knowledge Survey* is to develop and implement an assessment survey in order to develop a ‘profile’ of teachers’ pedagogical knowledge. Findings will be useful not only in identifying knowledge gaps in the current teaching workforce, but also among cohorts of pre-service teachers currently undergoing teacher preparation. How teachers’ pedagogical knowledge relates to quality will be investigated by examining how variations in knowledge are related to learning opportunities in teacher education and aspects of professional competence, which are our second and third research objectives described below.

## **Research Objective #2: How does teachers’ pedagogical knowledge relate to learning opportunities?**

7. Defining expert teaching and identifying expert teachers are complex issues given that conceptualisations of ‘expert teaching’ are culturally-dependent and often lack objective criteria (Berliner, 2001). Based on a review of the literature reported in Berliner (2001, 2004), expert teachers are characterised as having the following features: better use of knowledge; extensive pedagogical content knowledge, including deep representations of subject matter knowledge; better problem solving strategies; better adaptation and modification of goals for diverse learners; better skills for improvisation; better decision making; more challenging objectives; better classroom climate; better perception of classroom events; better ability to read cues from students; greater sensitivity to context; better monitoring of learning and providing feedback to students; more frequent testing of hypotheses; greater respect for students; and display of more passion for teaching.

8. Sternberg and Horvath (1995) used findings from psychological research on expert performance to characterize the features of the prototypical expert teacher and identified three basic ways in which experts differ from novices: (1) experts bring more knowledge to bear in solving problems than do novices, (2) experts are able to solve problems more efficiently than are novices, and (3) experts are more able to arrive at insightful solutions to problems than are novices. The main driver behind expert teachers’ ability to solve problems more efficiently and to arrive at more insightful solutions than novices is the knowledge they hold, which Sternberg and Horvath propose to be the most important feature of expertise. Westerman (1991) investigated development of teacher decision-making and reported that integration of knowledge (e.g., combining new subject content knowledge with prior knowledge) was one of the notable differences between novices and experts.

9. Empirical studies on the nature of expertise have revealed that teaching expertise is developed over time and that it takes about five to seven years for new teachers to learn the knowledge and skills to a sufficient degree where they can have an impact on student outcomes (e.g., Berliner, 2004). It has been proposed that learning to teach is more complex and different from other forms of learning, because the

learning growth of student teachers goes beyond simply assimilating new academic knowledge. It must also incorporate the new knowledge derived from experiential and practical experiences in the classroom (Calderhead, 1991). The assumption here is that student teachers have access to learning opportunities, both academic and experiential, in order to begin building the foundation of a knowledge base that can develop into expertise. However, variations exist in the quality of those learning opportunities.

10. A new body of research is investigating precisely this issue by looking at student teachers' 'opportunities to learn' during initial teacher education. This research examines the types of pedagogical content pre-service teachers are exposed to in teacher preparation programmes and the extent to which they have opportunities to learn the various content (Schmidt, Cogan, & Houang, 2011; Schmidt, Houang, Cogan, Blömeke, Tatto, Hsieh, Santillan, et al., 2008; Schmidt, Tatto, Bankov, Blömeke, Cedillo, Cogan, et al., 2007). These studies are beginning to show that variations in opportunities to learn in teacher preparation are related to differences in student achievement as assessed by international studies such as PISA and TIMSS. More specifically, teachers from countries that are top performers in PISA and TIMSS tend to have more opportunities to learn both content and pedagogy. This is confirmed by the TALIS 2013 survey where only 73% and 70% of teachers reported having received any formal education or training in content or pedagogy, respectively, in the subjects they teach (OECD, 2014).

11. Other, less-studied factors that need better understanding in investigations of teacher quality have to do with teacher educators. Teacher educators play a key role in providing high-quality learning opportunities, not only to teacher candidates in initial teacher education, but also to in-service teachers in professional development. However, little is known about the professional profile of teacher educators. Several reports from the European Commission (2010, 2013) highlight that teacher educators in European countries are a heterogeneous group with large variations in level of qualifications (BA, MA, or PhD) and expertise (they can be school teachers, educational researchers, subject experts (e.g., mathematicians), or pedagogical experts). The profession of teacher educator is less well-developed, or under-developed, with a range of variability in hiring practices, roles, and competencies that are likely to affect the quality of teaching provided, and thus the 'opportunities to learn' for teacher candidates.

12. Another purpose of the *ITEL Teacher Knowledge Survey* is to begin to get a better understanding of the learning outcomes of initial teacher education by investigating the relationship between learning opportunities and assessed pedagogical knowledge. Supplemented with institutional- and school-level data, analyses will investigate variability in pre-service and in-service teachers' pedagogical knowledge by examining the learning opportunities available to teacher candidates in initial teacher education and to in-service teachers in professional development. The profile of teacher educators, including their assessed pedagogical knowledge, will be included in these analyses.

### **Research Objective #3: How does teachers' pedagogical knowledge relate to professional competence?**

13. Teachers' pedagogical knowledge is a component of teacher professionalism, but professional competence involves more than just knowledge. Based on a review of various professions, including medical practice, Kunter, Klusmann, Baumert, Richter, Voss, and Hachfeld (2013) report that 'competence' can be defined as the "skills, knowledge, attitudes, and motivational variables that form the basis for mastery of specific situations" and that these characteristics are both learnable and teachable (p. 807). 'Professional competence' occurs when mastery of situations is dependent on the application of knowledge, skills, attitudes, and motivation to highly complex and demanding professions, such as teaching. It follows from this conceptualisation of professional competence that the ability to solve work-related problems requires having, not only the cognitive abilities for developing effective solutions (i.e., pedagogical knowledge), but also the right motivation and attitudes (Blömeke & Delaney, 2012).

14. Empirical studies on the personal indicators of teacher quality have shown that, in addition to profession-specific knowledge, teachers' beliefs, work-related motivation, and professional self-regulation are related to successful teaching. For example, Kunter, Klusmann, Baumert, Richter, Voss, and Hachfeld (2013) reported a positive relationship to student achievement gains and better instructional quality because these teachers provided more cognitively activating instruction and better learning support and classroom management. This in turn influenced student achievement and student motivation, respectively. These findings demonstrate the importance of teacher motivation and self-regulation to instructional quality. In fact, research has shown that teacher self-regulation is related to occupational well-being and instructional quality, two issues highly relevant to teacher policy (Klusmann, Kunter, Trautwein, Lüdtke, & Baumert, 2008).

15. Another group of researchers (Blömeke & Delaney; 2012; Blömeke, Felbrich, Müller, Kaiser, & Lehmann, 2008) who are conducting empirical investigations of teachers' professional competence propose a model in which professional competence is hypothesized to be comprised of: (1) cognitive abilities (i.e., professional knowledge, such as content knowledge, pedagogical content knowledge, and general pedagogical knowledge) and (2) affective-motivational characteristics (defined as professional beliefs about teaching and learning and the subject content, motivation, and self-regulation).

16. The empirical investigation of teachers' professional competence is in its early stages. The few studies thus far indicate that pedagogical knowledge is a critical component of teaching competence, but that knowledge alone is insufficient. Psychological factors, such as beliefs, motivation, and self-regulation, are also part of teaching competence. To better understand teachers' professional competence, our *Teacher Knowledge Survey* will also investigate how teachers' affective and motivational characteristics relate to variations in pedagogical knowledge. As much as possible, these factors will be examined in relation to learning opportunities in teacher education to better understand how policy improvements can be made to address issues such as teacher selection and retention.

### ***Teacher Decision-Making: Connecting Knowledge to Practice***

17. A teacher must be able to use her pedagogical knowledge to make rapid on-line decisions in the classroom, which is typically an ill-structured and constantly changing environment where information that arises while in the performance of teaching must be used to inform performance as it is occurring. The empirical research suggests that in order to make informed pedagogical decisions, teachers must be able to analyse and evaluate specific learning episodes, in combination with contextual and situational factors (e.g., students' prior knowledge, ability level, motivational factors, lesson objectives, curriculum goals, etc.) and to be able to connect all this information to their technical knowledge of the teaching-learning process in order to guide subsequent teaching actions.

18. Researchers have studied how teacher knowledge is used in decision-making by investigating teachers' ability to notice and reason about classroom events (Sherin & van Es, 2009; van Es, 2009; van Es & Sherin, 2008; also Blömeke, Gustafsson, & Shavelson, 2015). Noticing refers to teachers' ability to direct their attention to relevant classroom situations as they are occurring. Reasoning refers to teachers' cognitive processing and interpreting of the instructional events to which their attention is directed based on their knowledge of teaching and learning. Research has identified three aspects to this reasoning process: (1) the ability to describe what has been noticed, (2) higher-order processes to connect the observed classroom event to prior knowledge and understanding of teaching and learning, and (3) knowledge-based reasoning processes to evaluate and predict what might happen as a result of connecting the observed situation to prior knowledge of teaching and learning (Seidel, Stürmer, Blomberg, Kobarg, & Schwindt, 2011). Together, noticing and reasoning about classroom events interact in a dynamic manner and require (1) a high level of domain-general pedagogical knowledge about effective teaching and how it relates to students' learning processes and (2) the ability to apply such knowledge for the planning and

implementation of instruction to the current situation (Stürmer, Könings, & Seidel, 2013). Thus, teachers make (and implement) decisions as a result of identifying and interpreting important events in the midst of instruction based on their pedagogical knowledge. In other words, making good pedagogical decisions hinges on the quality of the pedagogical knowledge held by the teacher.

19. Our ITTEL *Teacher Knowledge Survey* will be able to capture some aspects of decision-making with cognitively-demanding items asking teachers about applying their knowledge to specific situations. This component of our framework is planned for further development in the next cycle of the survey.



## **ANNEX B: ITEL *TEACHER KNOWLEDGE SURVEY*: SAMPLING REQUIREMENTS FOR PARTICIPATING COUNTRIES**

### **Introduction**

1. This document describes the sampling plan for countries participating in the ITEL *Teacher Knowledge Survey*. Participating countries are not required to have randomized representative samples. However, to maximize the impact of findings, countries are asked to select one sub-national region from which to recruit the samples. The minimum size for EACH target sample (of pre-service teacher candidates, in-service teachers, and teacher educators) is at least 100 individuals. Countries can choose to increase the sample size by implementing the survey in more than 1 region of the country (see instructions below for implementing this option). The requirements at each level (national, institutional, and individual) are given below.

### **At National Level**

2. The following are requirements at national level:
- Select one region at the sub-national level from which each of the 3 target samples will be recruited.
3. The following national-level options are possible:
- Implementing the survey in more than 1 sub-national region (see instructions below)
  - 3 national options are possible within EACH sub-national region (see Table 1 below).

### **At Institutional Level**

4. The following are requirements at institutional level:

#### **Sample 1: Pre-Service Teacher Candidates**

- At a university or teacher education college/institution within the selected sub-national region
- Recruit as many institutions within that region as necessary to get at least 100 individuals
- To implement the survey in more than 1 region, same procedure applies: Recruit as many institutions within EACH region as necessary to get AT LEAST 100 individuals in EACH region.

#### **Sample 2: In-Service Teachers**

- In a school within the selected sub-national region
- Public schools only
- Recruit as many schools within that region as necessary to get at least 100 individuals

- To implement the survey in more than 1 region, same procedure applies: select as many schools within EACH region as necessary to get AT LEAST 100 individuals in EACH region.

### Sample 3: Teacher Educators

- At a university or teacher education college/institution within the selected sub-national region
- Recruit as many institutions within that region as necessary to get at least 100 individuals
- To implement the survey in more than 1 region, same procedure applies: select as many institutions within EACH region as necessary to get AT LEAST 100 individuals in EACH region.

### **At Individual Level**

5. In general, at individual level, requirements are:

- Teaching or studying to teach at ISCED 2 (lower-secondary)
- Core subjects are maths, science, and mother tongue
- Substitute teachers are to be excluded
- Special education teachers are to be excluded
- See Table 2 for a list of courses in General Pedagogy

**Table A.1. Core Samples and National Options**

	<b>Core Samples (at least n = 100)</b>	<b>National Option 1</b>	<b>National Option 2</b>	<b>National Option 3</b>
<b>Sample 1</b>				
Pre-Service Teacher Candidates	<ul style="list-style-type: none"> <li>- Pre-service teacher candidates in their <u>last year</u> of training</li> <li>- Studying to be ISCED 2 teachers of maths, science, or mother tongue</li> <li>- Before they become fully qualified/certified)</li> </ul>	<ul style="list-style-type: none"> <li>- First year in-service teachers</li> <li>- Teaching maths, science, or mother tongue at ISCED 2 level</li> </ul>		
<b>Sample 2</b>				
In-Service Teachers	<ul style="list-style-type: none"> <li>- At least 5 years teaching experience</li> <li>- Up to maximum 15 years teaching experience</li> <li>- Teaching at least 50% of full-time hours</li> <li>- Teachers of maths, science, or mother tongue at ISCED level 2</li> </ul>	<ul style="list-style-type: none"> <li>- 20 or more years of teaching experience</li> </ul>		
<b>Sample 3</b>				
Teacher Educators	<ul style="list-style-type: none"> <li>- Instructors who teach one or more required courses in <b>general pedagogy</b></li> <li>- <b>NOT</b> instructors of teaching methods (or didactics) of a specific subject</li> <li>- <b>NOT</b> instructors of subject</li> </ul>	<ul style="list-style-type: none"> <li>- Instructors who do not have a PhD</li> <li>- Instructors who taught previously, but not during the last 12 months</li> </ul>	<ul style="list-style-type: none"> <li>- Instructors who teach subject didactics in maths, mother tongue, or science (teaching methods for a specific subject)</li> </ul>	<ul style="list-style-type: none"> <li>- School-based educators (e.g., mentors, induction supervisors)</li> </ul>

	<b>Core Samples (at least n = 100)</b>	<b>National Option 1</b>	<b>National Option 2</b>	<b>National Option 3</b>
	content courses - Instructors who teach or taught pre-service candidates during the last 12 months - At least a PhD qualification - Responsible for regularly teaching pre-service teacher candidates at a university or teacher education college/institution - Instructors of pre-service candidates training to teach at ISCED level 2			

**Table A.2. Courses in General Pedagogy**

<b>Course</b>	<b>Examples of Topics Covered</b>
History of Education and Educational Systems	historical development of the national system, development of international systems
Philosophy of Education	ethics, values, theory of knowledge, legal issues
Sociology of Education	purpose and function of education in society, organization of current educational systems, education and social conditions, diversity, educational reform
Educational Psychology	learning theories; motivational theories, child development (cognitive, motivational, emotional)
Theories of Schooling	goals of schooling, teacher's role, curriculum theory and development, didactic/teaching models, teacher-pupil relations, school administration and leadership
Methods of Educational Research	read, interpret and use education research; theory and practice of action research
Assessment and Measurement	theory and practice of assessment and measurement, diagnosing principles, evaluation procedures
Knowledge of Teaching	knowing how to teach pupils of different backgrounds and abilities, use resources to support instruction, manage classrooms, communicate with parents