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Understanding teachers' pedagogical knowledge: report on an international pilot study

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UNDERSTANDING TEACHERS' PEDAGOGICAL KNOWLEDGE - REPORT ON AN INTERNATIONAL PILOT STUDY

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By Kristina Sonmark, Nóra Révai, Francesca Gottschalk, Karolina Deligiannidi, Tracey Burns

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ABSTRACT

What is the nature of teachers' pedagogical knowledge? The Innovative Teaching for Effective Learning Teacher Knowledge Survey (ITEL TKS) set out to answer this question in a pilot study that ran in five countries: Estonia, Greece, Hungary, Israel and the Slovak Republic. Using convenience samples, the pilot assessed the pedagogical knowledge base of teachers, teacher candidates and teacher educators. Pedagogical knowledge was broken down into the domains of assessment, instructional processes and learning processes. The link between teachers' knowledge and characteristics of teacher education systems, opportunities to learn and motivational characteristics was also examined.

The ITEL TKS pilot demonstrated the feasibility of researching teachers' pedagogical knowledge profiles across countries, and validated an innovative instrument for assessing general pedagogical knowledge in an internationally comparative way. It also allowed for reflection on potential adaptations to strengthen the design of future work. The results serve as a template for a larger-scale study to explore teacher knowledge and competences in nationally representative samples.

RÉSUMÉ

Quelle est la nature du savoir pédagogique des enseignants ? La « Pédagogie Innovante pour un Apprentissage Efficace – Enquête sur les Connaissances des Enseignants » (ITEL TKS) fut conçue pour répondre à cette question s'appuyant sur une étude pilote menée dans cinq pays : l'Estonie, la Grèce, la Hongrie, Israël et la République Slovaque. Basé sur des échantillons de commodité, l'étude évalua la base de savoir pédagogique des enseignants, des candidats enseignants et des formateurs d'enseignants. Le savoir pédagogique se décompose alors en plusieurs domaines : l'évaluation, le processus pédagogique, et le processus d'apprentissage. Le lien entre le savoir des enseignants et les caractéristiques des systèmes éducatifs, les opportunités d'apprentissage et les caractéristiques de motivation, fut également examiné.

Le projet ITEL TKS a montré la faisabilité d'étudier les profils de savoir à travers plusieurs pays, et a validé un instrument innovateur permettant d'évaluer le savoir pédagogique générales sous un aspect de comparaison internationale. Il a ainsi permit une réflexion sur des potentielles adaptations visant à renforcer la conception du travail future. Les résultats servent de modèle pour une étude de plus large échelle pour explorer le savoir des enseignants sur des échantillons nationalement représentatifs.

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CHAPTER 1: THE INNOVATIVE TEACHING FOR EFFECTIVE LEARNING (ITEL) TEACHER KNOWLEDGE SURVEY

Introduction

Improving student outcomes is also about improving the quality of the teaching workforce. Teacher quality is an important factor in determining gains in student achievement, even after accounting for prior student learning and family background characteristics (e.g. Darling-Hammond, 2000; Hanushek, Kain and Rivkin, 1998; Muñoz, Prather and Stronge, 2011; Wright, Horn and Sanders, 1997). In recent years, however, recruiting and retaining quality teachers has become a challenge among some OECD countries. In addition to the ageing of the teaching workforce, some countries experience high rates of attrition among new teachers and a shortage of quality teachers in high-demand subject areas and disadvantaged schools. There is also concern about attracting high-achieving and motivated candidates into teacher education programmes (OECD, 2016a). Issues such as these have an impact on the quality of the resulting teaching workforce that is tasked with improving student outcomes. Consequently, there is a push to improve the quality of teacher education. An increase in the quality of teacher education and professional development throughout the career can contribute to an increase in student achievement through more effective teaching.

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 (Guerriero, 2017). This includes teaching '21st century skills' (for example, creativity, critical thinking, problem solving, collaboration, and communication, among others) in increasingly diverse classrooms in many OECD countries. These new demands may require teachers to deviate from traditional teaching methods in innovative ways. 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 to determine whether and to what extent re-skilling is required.

Teachers possess highly-specialised knowledge that continually transforms as new knowledge emerges from practice and research or is shared through professional communities. Pedagogical knowledge refers to the specialised body of knowledge of teachers for creating effective teaching and learning environments for all students. There is agreement that a high level of pedagogical knowledge is part of competent teaching, yet there remains the need to assess teacher knowledge as an outcome of teacher education systems and as a predictor of effective teaching and student achievement. These questions are important for OECD countries as they improve policies on the teaching workforce, including initial teacher education, induction and mentoring, and professional development.

The Centre for Educational Research and Innovation (CERI) embarked on the Innovative Teaching for Effective Learning (ITEL) project to explore what teaching as a knowledge profession in the 21st century means for qualifying teachers. After extensive theoretical and conceptual work (Guerriero, 2017), the project designed a survey to address the above questions with data from OECD countries. The purpose of the ITEL Teacher Knowledge Survey (TKS) is to better understand the nature of teachers' pedagogical knowledge, and more generally, professional competence, which

involves situating teachers in a broader context and identifying how they are shaped and evolve. There is thus a need to examine learning opportunities in teacher education, including teaching practicum and professional development, and how teachers' knowledge relates to motivational factors and incentives for choosing the profession. To address these, this study is guided by the following three policy challenges:

1. To what extent do teachers have the knowledge and skills for teaching 21st century skills?

2. To what extent are initial teacher education programmes providing teacher candidates with opportunities to learn the knowledge and skills needed to effectively teach students for the 21st century labour market?

3. Can the quality of the teaching workforce be improved by having a better understanding of the factors that drive teachers' professional competence?

In the current pilot study these broad policy questions narrow down to research questions formulated to explore what teachers' pedagogical knowledge looks like. For example, what are the strengths and weaknesses of teachers' knowledge base? Do teachers know more about pedagogy related to lesson planning and evaluation than they do about differentiated instruction adapted to a diverse student body? How does pedagogical knowledge develop throughout the career? Besides formal learning, what are the informal and non-formal learning channels through which teachers can ensure that their knowledge base is up to date? What factors contribute to the choice of becoming a teacher? What makes teachers remain in the profession?

The ITEL TKS instrument presented in this report integrates these distinct yet highly interrelated components of teachers' professional competences through a survey conducted both among teachers and teacher candidates. The instrument provides the potential for analysing the relationships between learning opportunities and knowledge, as well as motivational factors and drivers of teachers' professional competence. It also helps in identifying policy-relevant mediators in these relationships.

The ITEL TKS also makes a unique contribution to the overall studies on teachers within the OECD, given its focus on teachers' pedagogical knowledge and the context in which it is shaped. The Teaching and Learning International Survey (TALIS) is for example a rich source of evidence on teachers, as among other indicators, it measures practices in the classroom and self-reported instructional processes. On the other hand, the ITEL TKS captures teachers' specialised knowledge in instructional processes and the strengths and weaknesses in teachers' pedagogical knowledge base. These two components are an important part of the broad picture. To illustrate, the instrument connects teachers' self-reports on how they motivate students who show low interest in schoolwork with evidence on what they know about student motivation. Understanding student motivation is important for teachers, who must not only keep students engaged in learning, but also identify students with motivational problems in order to intervene. Hence, the analytical link between what teachers know and what they do in their everyday classroom practices is an important contribution to understanding teacher professionalism and can lead to better-targeted policy interventions.

The ITEL TKS instrument captures knowledge related both to theoretical concepts and to practice, but with greater emphasis on the former. In this phase of the study, the instrument focuses on knowledge of theories and concepts, and on evidence of the use of these in practice. It places less emphasis on teachers' competencies in noticing, interpreting and analysing classroom events (professional decision-making), and does not address their actions in the classroom. As the survey is unable to capture teachers' professional competence in its full complexity, it cannot be regarded as a universal norm for teacher knowledge. Nevertheless, it is a starting point for exploring the nature of

teachers' pedagogical knowledge in order to better understand how it is developed in teacher education and throughout the career, and how it results in teachers' professional competence.

This report

This chapter gives an overview of the theoretical foundations for investigating teachers' pedagogical knowledge, including the conceptual framework underlying the ITEL TKS and a description of the different components of the instrument. Chapter 2 summarises the technical aspects of data collection and presents the results of the instrument's statistical validation. Chapter 3 gives a short overview of the wider context of teachers in participating countries based on international and national data, and describes initial teacher education systems in the participating countries. The profiles of teachers' and teacher candidates' general pedagogical knowledge based on the data collected through the instrument is looked at in Chapter 4. Within Chapter 5, teachers' and teacher candidates' learning opportunities in initial teacher education and professional development is explored. It discusses both the content and aspects of the quality of opportunities to learn, as well as how these relate to pedagogical knowledge. Chapter 6 presents teachers' and teacher candidates' affective-motivational competencies as measured by the ITEL TKS. This report ends with the pending agenda, and a look at options for developing the survey instrument for future work.

The teacher knowledge survey instrument

The ITEL TKS was preceded by extensive theoretical work, much of which is summarised in the volume entitled *Pedagogical Knowledge and the Changing Nature of the Teaching Profession* (Guerriero, 2017). The broad conceptual framework of teachers' professional competence that we present here largely draws on this theoretical book. This chapter also introduces the framework used for assessing teachers' pedagogical knowledge in the ITEL TKS, describes the different components of the survey, and discusses the process of item development.

Conceptual framework of professional competence

Teachers face increasingly complex challenges today, such as adapting to rapidly changing environments, working with student groups of growing heterogeneity, and developing transversal competences and 21st century skills. Meeting such expectations requires teachers to be professionals who base their everyday practice on regularly updated professional knowledge. Grounding practice in a coherent and integrated knowledge base is a fundamental characteristic of professions; however, whether teaching has such a knowledge base remains a topic of debate (Guerriero, 2017).

Box 1.1. Conceptualising knowledge and learning

Numerous scholars in different disciplines such as cognitive psychology, sociology, information science, economics and philosophy have studied knowledge and learning, each making contributions with unique conceptual approaches and reflections to the rich literature in this domain.

1. Cognitive psychology

- Knowledge is a property of an individual mind.
- The main concern is how knowledge is related to behaviour.

(Mulcahy, 2012; Paavola, Lipponen and Hakkarainen, 2004)

2. Social constructivism

- Knowledge is constructed within social contexts through interactions with a community.
- Knowledge is distributed over groups of individuals and their environment.
- Learning is not simply the assimilation and accommodation of new knowledge, but also inseparable from the social context and thus situated by nature.

(Hardy, 2010; Mulcahy, 2012; Lave and Wenger, 1991; Gherardi, 2006; Kools and Stoll, 2016)

3. Socio-material approaches

- Knowledge is constructed in a socio-material environment: knowledge and learning are embedded in the action and interaction of not only human actors, but also material elements.
- Knowledge is dynamic and emerges in the activities of teachers as they interact with each other, students and other actors, as well as with texts, instruments or technologies.

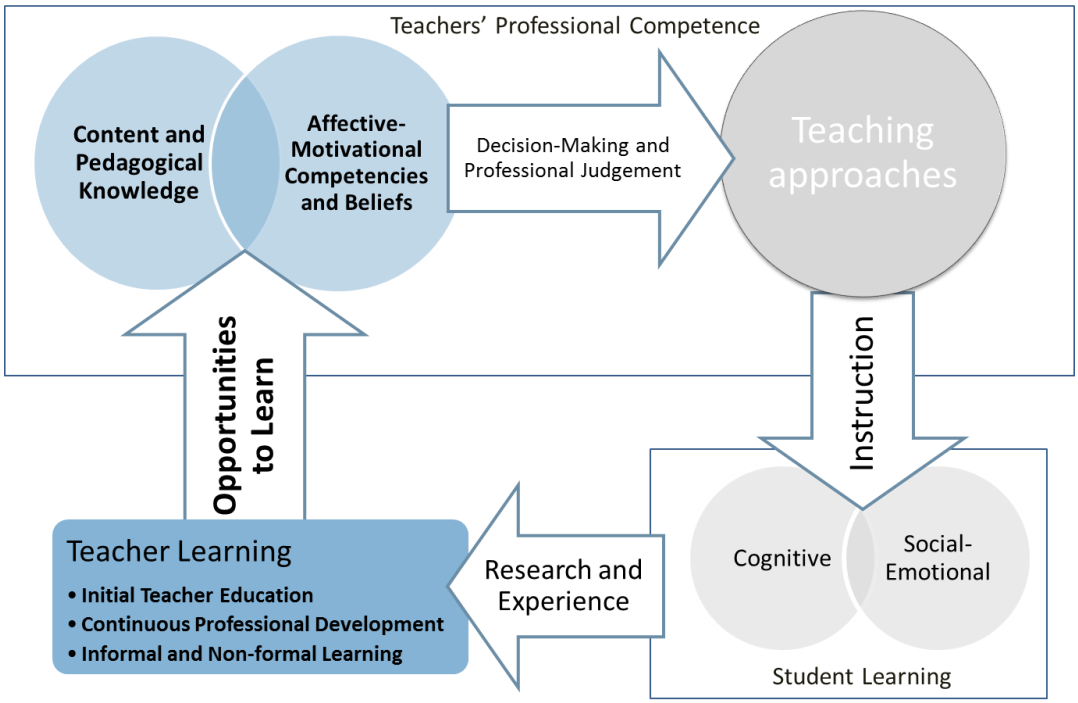
(Fenwick, Nerland and Jensen, 2012; Mulcahy, 2012)

All of these theories are relevant and have been applied to investigate different aspects of teachers' knowledge using diverse methodologies, including quantitative and qualitative approaches.

The ITEL project investigates teachers' knowledge as a crucial component of teacher quality. Its objective is to better understand the specialised knowledge teachers have of teaching and learning, and whether it is updated and improved by new research findings and adapted to 21st century societal needs. The instrument allows for a broad view of teacher knowledge across different countries, as well as the nuances of the knowledge base within countries, depending on the contextual setting and the objectives of teacher education. The pilot study focused on individual teacher knowledge (aligned with the cognitive psychology school of thought, see Box 1.1). Although shared knowledge is also an important component of teacher expertise, the necessity that the instrument be cross-culturally valid and implementable on a large scale made this the most feasible choice as a first step. While benchmarking and "ranking" is the norm in many international surveys, the ITEL TKS avoids this, and rather presents the nature of teachers' knowledge in different contexts through the relative strengths and weaknesses in terms of the domains within which knowledge has been situated in this study (see Chapter 4).

The conceptual framework that serves as the basis for the study is grounded in empirical and conceptual research in the area of teachers' knowledge. The framework (Figure 1.1) takes a broad perspective of teachers' professional competence, where competence is defined as "the ability to meet complex demands in a given context by mobilising various psychosocial (cognitive, functional, personal and ethical) resources" (Guerriero, 2017: 261). As such, teachers' knowledge is part of their competence.

Figure 1.1. Conceptual framework of teachers' professional competence



Source: Adapted from Guerriero, S. and N. Révai (2017), "Knowledge-based teaching and the evolution of a profession", in *Pedagogical Knowledge and the Changing Nature of the Teaching Profession*, http://dx.doi.org/10.1787/9789264270695-13-en.

Research and experience related to the teaching and learning process continuously feed into the knowledge base that is transferred to and also co-constructed by teachers through individual and collective learning. Teachers' learning opportunities shape not only their knowledge of the subject(s) they teach and pedagogy in general, but also their beliefs about teaching and other motivational and affective competences. Teachers draw on such knowledge and competences to make decisions in the classroom. This is a complex skill that involves analysing and evaluating specific learning episodes or contextual and situational factors (e.g. students' prior knowledge, ability level, motivational factors, lesson objectives, curriculum goals), and connecting them to the knowledge of teaching and learning (Blömeke, Gustafson and Shavelson, 2015; Stürmer and Seidel, 2017).

Professional judgement guides the subsequent teaching approaches, which include curriculum and lesson planning, selecting and applying sets of teaching methods, ways of classroom management, student assessment, and so on. Instruction is, in turn, the implementation of teaching approaches as manifested in interactions with students, teacher behaviour, and in the tools and materials used in the classroom. This then influences both cognitive and socio-emotional aspects of student learning.

The cycle represented in Figure 1.1 should not be interpreted as a series of linear relationships between the elements. The teaching and learning process is highly complex and the different pieces are in continuous and dynamic interaction with one another. For example, as teachers observe and reflect on student learning in the classroom, their decisions are influenced not only by a well-established knowledge base but also by their real-time experience. This dynamic process is itself part of their informal learning. Teachers' knowledge thus both informs teaching strategies and is generated as a consequence of an active and ongoing process (Loughran, 2013). Capturing such complexity through an international comparative study is challenging. The ITEL pilot study thus set out to explore

the content and quality of teachers' opportunities to learn, the nature of their specialised knowledge, and motivational characteristics as a first step in unfolding the complexity of the teaching profession.

Teacher Knowledge Survey instrument

The following section discusses the conceptual background and constructs of the three main components explored in the ITEL TKS: teachers' pedagogical knowledge, their opportunities to learn, and affective-motivational competencies, as well as the sources and process of item development. In addition, a small component of the instrument looks at the quality of instruction through teachers' reports of some aspects of their practice, which is described in Box 6.1 in Chapter 6.

How do we assess teacher knowledge?

Teachers' specialised knowledge encompasses a range of different fields and types of knowledge. Some of these are common to all teachers (e.g. knowledge of child development or forms of evaluation), while some differ based on the teacher's subject (e.g. knowledge of mathematical concepts, language or history), the age group taught, or the educational context (e.g. knowledge of curriculum). Shulman (1986, 1987) proposed a typology of teachers' knowledge base comprised of seven categories, of which three have been particularly influential to further research:

- general pedagogical knowledge (principles and strategies of classroom management and organisation that are cross-curricular)
- content knowledge (knowledge of subject matter and its organising structures)
- pedagogical content knowledge (knowledge of content and pedagogy).

This model has been further developed and has given rise to a number of empirical studies investigating the impact of these three components on student achievement and the quality of instruction. A review of evidence has shown all three to be relevant to understanding quality teaching, indicating that content knowledge alone is insufficient (Baumert et al., 2010; Voss, Kunter and Baumert, 2011). While there is substantial proof of the importance of pedagogical content and content knowledge, evidence on general pedagogical knowledge is scarcer (Guerriero, 2017).

General pedagogical knowledge

The ITEL pilot study chose to focus on general pedagogical knowledge because evidence of its role in quality teaching and learning was promising, yet limited. One of the reasons for the lack of evidence might have been the difficulty in defining the concept in a way that is cross-culturally relevant (Guerriero, 2017). Shulman's original definition (1987), which was restricted to classroom management and organisation, has since been extended to include a broader understanding of the teaching and learning process (Guerriero, 2017).

For the purposes of the ITEL TKS, we define general pedagogical knowledge as the specialised knowledge of teachers in creating and facilitating effective teaching and learning environments for all students, independent of subject matter (Guerriero, 2017). Models that identify the specific content[1] of general pedagogical knowledge either follow a disciplinary or task-based approach. The former derives content from academic disciplines underlying general pedagogy, such as educational

[1] For a detailed discussion and definition of general pedagogical knowledge, see Chapter 4 in Guerriero, 2017.

psychology, didactics or sociology of education, while the latter places emphasis on typical teacher tasks such as classroom management or working with heterogeneous student groups (König, 2014). A review of empirical evidence on teachers' general pedagogical knowledge concluded that the content outcomes of these approaches are similar, and identified three main overlapping components:

- instructional process (teaching methods, didactics, structuring a lesson and classroom management)
- student learning (cognitive, motivational, emotional dispositions of individual students; their learning processes and development; student heterogeneity and adaptive teaching strategies)
- assessment (diagnosis principles and evaluation procedures) (König, 2014).

The ITEL TKS adopted these three components in its framework for assessing teachers' general pedagogical knowledge. Each broad dimension is further specified into two sub-dimensions[2].

Table 1.1. Description of the ITEL TKS assessment framework and selected topics

Dimension	Sub-dimension	Description
Instructional process	Teaching methods and lesson planning	Productively utilising instructional time through use of various teaching methods (e.g. direct instruction, discovery learning), knowing when and how to apply each method to promote students' conceptual understanding of learning tasks (Voss, Kunter and Baumert, 2011), and structuring learning objectives, lessons, curricular units and assessment (König et al., 2011)
	Classroom management	Maximising instructional time through awareness of all classroom activity, handling multiple classroom events concurrently, pacing lessons appropriately to maintain momentum, providing clear directions and maintaining student attention (Voss, Kunter and Baumert, 2011)
Learning process	Learning and development	Fostering individual learning through knowledge of various cognitive learning processes, including learning strategies, impact of prior knowledge, memory and information processing, causal attributions, effects and quality characteristics of praise, and opportunities for increasing student engagement (Voss, Kunter and Baumert, 2011)
	Affective-motivational dispositions	Knowledge of motivational learning processes (e.g. achievement motivation) and strategies to motivate a single student or whole group (Voss, Kunter and Baumert, 2011; König et al., 2011)
Assessment	Evaluation and diagnosis procedures	Knowledge of different forms and purposes of formative and summative classroom assessments, and how various frames of reference (e.g. social, individual, criterion-based) impact student motivation (Voss, Kunter and Baumert, 2011), and quality of assessment
	Data and research literacy	Knowledge of interpreting, evaluating and using research and data to inform the teaching and learning process (e.g. relevance, validity, reliability)

The framework also includes three supplementary measures of knowledge. First, a modified version of Anderson and Krathwohl's (2001) model of cognitive processing was adopted to capture variations in cognitive demands that typically differentiate between easier items (e.g. recall of facts)

[2] Originally, the Learning process dimension also included "Classroom heterogeneity and adaptive teaching" as a third sub-dimension; however only two items were developed to assess knowledge of this topic, both of which were dropped in the review process.

and harder items (e.g. items requiring understanding or analysing information)[3]. Second, two main types of knowledge – theoretical/scientific and practice-based – are distinguished based on whether they involve abstract, academic knowledge, or instead apply such knowledge to contexts and thus require a certain degree of professional judgement. Third, knowledge can also be described based on whether it takes a more traditional approach or includes innovative pedagogical approaches or recent academic research relevant to teaching (König, 2014). To theoretically validate the supplementary measures, five independent experts and a team from the OECD Secretariat categorised all pedagogical knowledge items into one of the two categories of which each of these measures is comprised. An item was assigned to a category only if at least five of the six opinions were the same. The number of items validated through this process is shown in Table 1.2.

Table 1.2. Supplementary measures of pedagogical knowledge

Cognitive demand	Recall	Teacher candidates / teachers must retrieve information from long-term memory in order to respond to a test item. Items of that type challenge teacher candidates / teachers to recall a definition, or identify elements of a phenomenon, term, or concept (11 items)	Based on TEDS-M (König, 2014)
	Understand/ Analyse	In order to respond to items of this type, teacher candidates / teachers must also retrieve information from long-term memory, but in addition, link that information to a problem outlined by the item. Hence, they must understand a phenomenon or a concept, or be asked to compare, categorise, assign or interpret a phenomenon, situation, or one or several general terms (17 items)	
Type of knowledge	Theoretical/ Scientific	Teacher candidates / teachers must use knowledge (of educational theories) that is formal, systematic, ordered and context-independent to answer these items (20 items)	Based on Shalem (2014)
	Practice-based	Teacher candidates / teachers must apply professional judgement to answer these classroom or situationally-phrased, context-specific items. Teacher judgement is interpreted here as deriving both from theoretical and working knowledge (i.e. a variety of contextually-specific experiences) (14 items)	
Thematic orientation	Core knowledge	Teacher candidates / teachers must use traditional educational concepts and theories (e.g. Piaget, Vygotsky, Bloom, Bandura, Erikson, etc.) to answer these items (29 items)	Based on Pellegrino and Hilton (2012) and Pellegrino (2017)
	Key demand for 21st century teaching	Teacher candidates / teachers must use recently developed concepts and theories that derive from educational neurosciences and/or are directly related to 21st century skills (e.g. critical thinking, reasoning and argumentation, initiative, metacognition, cooperation and communication, creativity, deep learning and transfer) (9 items)	

Item development

The ITEL pilot study implemented an online questionnaire. These items were sourced from various domains. Some were selected and adapted from existing instruments, such as the Teacher Education and Development Study in Mathematics (TEDS-M). The advantage of using such items is that they had already been validated across different country contexts.

[3] For resource efficiency reasons, the ITEL TKS instrument does not capture the third level of cognitive demand described in Anderson and Krathwohl's (2001) model, "Generate/Create", which requires teachers to generate strategies for how a teacher would solve the problem.

Box 1.2. Testing methods

Existing empirical studies on teachers' knowledge use various methodologies depending on their purpose and design:

- Written (paper-and-pencil or online) tests are used to measure either broad or specific knowledge (e.g. cooperative learning). They can involve multiple-choice or open-ended questions.
- Video-based assessments are applied both for measuring knowledge (broadly or focusing on a certain aspect) and for exploring decision-making and professional judgement or instructional practice.
- Rating the demonstration of teaching skills can also address all three knowledge domains, although it is typically focused on the instructional process (e.g. by analysing lesson planning).

Source: König, J. (2014), http://www.oecd.org/officialdocuments/publicdisplaydocumentpdf/?cote=EDU/CERI/CD/RD(2014)3/REV1&doclanguage=en.

Other items were developed by the OECD Secretariat and international experts through exploration and examination of empirical and theoretical evidence of teaching and learning. Newly developed items were validated via a review process to ensure that they were culturally sensitive and reliable (i.e. understood in the same way across samples within a country). Items were all multiple choice, and were presented either as a simple multiple choice (i.e. respondents were given a question with four response options – one was correct and three were incorrect) or complex multiple choice (i.e. respondents were given a question with four or more response options, and had to identify for each response option whether it was "right" or "wrong", "suitable" or "unsuitable", etc.; see Figure 1.2). In order to respond correctly, all parts of the question must be answered correctly.

Figure 1.2. Item illustrating the learning process dimension

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 before a test in mathematics, because he/she…	Intrinsic Motivation	Extrinsic Motivation
(a) Expects a reward for a good grade.	□	□
(b) Wants to avoid the consequences of a bad grade.	□	□
(c) Is interested in mathematics problems.	□	□
(d) Does not want to disappoint his/her parents.	□	□
(e) Wants to maintain his/her relative rank in the class.	□	□

Note: This item belongs to the motivational-affective dispositions sub-dimension, and is categorised as understand/analyse; theoretical/scientific knowledge.

How do we explore teachers' opportunities to learn?

Aspiring teachers learn the foundations of pedagogical knowledge in initial teacher education. Ideally, this includes theoretical-scientific content as well as opportunities to actively participate in the process of research and inquiry and learn how to interpret, validate and apply theory. Access to experiential opportunities such as observing and critically reflecting on lessons, or teaching lessons while guided by experienced mentors allow for the connecting of theory and practice. High-quality initial teacher education is just the first step in teachers' lifelong professional learning. Continuous professional development enables regular reflection and the broadening of the knowledge base. Further to formal courses, non-formal learning, such as conferences and seminars, school-based knowledge-sharing workshops or structured professional collaboration provide unique opportunities

for teachers to acquire and apply new knowledge. Informal learning, such as work-based teaching experiences, are also essential to deepening the understanding of teaching and learning.

The ITEL pilot study asks teacher candidates and teachers about the content and quality of their initial teacher education, and the latter about their professional development as well. The instrument includes access to experiential opportunities such as teaching practicum and opportunities to participate in the process of research and inquiry. Aspects of informal learning are revealed through examination of teachers' professional collaboration and their engagement with research. Data is also collected from teacher educators on their experiences as instructors and role models. Table 1.3 summarises the aspects of opportunities to learn as captured in the ITEL TKS.

Table 1.3. Dimensions of opportunities to learn in the ITEL TKS

Opportunities to learn: Main dimensions	**Subscales**	**Samples (in grey if relevant)**		
		Teacher candidates	Teachers	Teacher educators
Pedagogical content	Instructional process			
	Learning process			
	Assessment			
Quality of opportunities to learn	Quality of instruction			
	Demands			
	Student agency			
Teaching practicum	Quantity of experience			
	Scope of experience			
	Professional support			
Research activities	Engaging with research			
	Engaging in research			
Professional collaboration				
Teacher educator characteristics	Teaching methods			
	Student agency			

The items exploring opportunities to learn were based on previously validated instruments, in particular, the TEDS-M[4] instrument and the EMW-study[5] (König, 2014; König et al., 2014). Their relevance for the samples and the focus of the ITEL TKS were examined, and irrelevant items were dropped. Some of the very closely related items, particularly in the pedagogical content dimension, were collapsed to reduce the list. Most items were furnished with examples or a short description to make them easier to interpret in a cross-cultural context. For example, "Forms of performance assessment" was an item used in the EMW-study, which was adapted to "Forms of performance assessment (e.g. paper-and-pencil, computer-based tests, oral tests, multiple-choice, open-answer,

[4] TEDS-M is a comparative study carried out by the International Association for the Evaluation of Educational Achievement (IEA), which focused on the preparation of primary and lower secondary mathematics teachers. It is an international large-scale assessment of future teachers with representative samples from 17 countries. The study aimed to measure future teachers' professional knowledge including their content knowledge, pedagogical content knowledge, and general pedagogical knowledge (GPK) as a national option (König et al., 2011; König, 2014; König and Blömeke, 2007) in three countries (Chinese Taipei, Germany, USA).

[5] The EMW-study (Entwicklung von berufsspezifischer Motivation und pädagogischem Wissen in der Lehrerausbildung / Change of Teaching Motivations and Acquisition of Pedagogical Knowledge during Initial Teacher Education) assessed the GPK of future teachers in the three German-speaking countries: Germany, Austria and Switzerland.

etc.)" in the ITEL TKS. To measure teachers' engagement with research, as well as their professional collaboration with different groups, new items were developed based on research. All items were reviewed by experts from participating countries as well as two independent international experts, and were revised based on the comments received.

How do we explore teachers' affective-motivational competencies?

Teachers' professional competence is a multi-dimensional construct, encompassing cognitive resources and affective-motivational elements (Blömeke, 2017). Affective-motivational competencies include career-choice motivation, achievement motivation and goal orientation, as well as teachers' beliefs about teaching and learning and their perceptions of the profession (e.g. Blömeke and Delaney, 2012; König and Rothland, 2012). In addition, teachers' self-efficacy and professional responsibility are associated with instructional practices. The conceptual framework's broad category of affective-motivational competences and beliefs allows for investigating all of the above as part of teachers' competence.

In the ITEL TKS, teacher motivation was conceptualised based on the following constructs: self-efficacy, motivations and goal orientations for teaching, self-responsibility, and commitment to and enthusiasm for teaching (see Table 1.4). These constructs are founded upon established theories of motivation that are consistently relevant and applicable across different national and educational contexts (Lauermann, 2015).

Table 1.4. Teacher motivation dimensions with constructs and scales

	Construct	Scale	Source
Teacher motivation	Teacher self-efficacy	Efficacy in student engagement	Tschannen-Moran and Woolfolk Hoy, 2001
		Efficacy in instructional strategies	
		Efficacy in classroom management	
		Efficacy for student learning	Lauermann and Karabenick, 2013
	Motivations for teaching	Ability	Richardson and Watt, 2006
		Intrinsic career value	
		Extrinsic career value	
		Social career value	
	Goal orientations	Social goals of teachers	Butler, 2012
	Teacher self-responsibility	Self-responsibility for student motivation	Lauermann and Karabenick, 2013
		Self-responsibility for student achievement	
		Self-responsibility for relationships with students	
		Self-responsibility for teaching quality	
	Intrinsic orientations	Enthusiasm for teaching	Kunter et al., 2008
	Commitment to teaching	Planned persistence	Watt and Richardson, 2008
		Willingness to invest personal time	Lauermann et al., (forthcoming)
		Interest in professional development	

Conclusions and reflections

The conceptual framework underlying the ITEL pilot study was based on robust theoretical and empirical research evidence and operationalised in a comprehensive instrument as demonstrated

above. Nevertheless, it has a number of limitations that should be addressed before this survey can be implemented on a larger scale.

First, and perhaps most importantly, the instrument captures only a portion of the complexity of teachers' professional competence and pedagogical knowledge. This can be improved by adjusting the various instruments to better convey the nuances and dynamic nature of knowledge development and transfer. However, there is also a structural limitation due to the aim of the survey, which is to measure general pedagogical knowledge. In order to have a meaningful assessment, it is necessary to have items with clearly right or wrong answers that are underpinned by research evidence. Yet knowledge evolves through time and ongoing discovery, and the question of how best to capture this dynamic remains unsolved. How do we deal with current research evidence that may be challenged or contested in the future? And what about that which is already disputed in certain research communities?

As education research is still relatively immature, many of its domains remain under-researched. As a result, teachers could possess knowledge of pedagogical instruction for which there may not currently be any clear scientific evidence. This does not mean that it is not important - for example, evidence of the most recent innovative pedagogies is not yet robust, but clearly they are crucial to both policy and practice. Some teacher education programmes may prioritise practical knowledge over scientific knowledge of the teaching and learning process, yet this type of knowledge could be potentially omitted or understated in an instrument that requires a body of strong research knowledge to underpin survey response choices. Therefore, although the correct answers to the items have been verified by a number of experts, others may still contest their content. While some of these issues are unsolvable, those that can be addressed will be improved as this instrument is further developed.

CHAPTER 2: DATA COLLECTION AND VALIDATION OF INSTRUMENTS

Introduction

In 2015, OECD member countries were invited to participate in the Centre for Educational Research and Innovation (CERI) Governing Board's ITEL TKS pilot study, including its initial phases of instrument development and conceptual design. Estonia, Greece, Hungary, Israel and the Slovak Republic took part in both the development and pilot of the instrument, while Austria and the Netherlands provided input on the study's conceptual and theoretical design. In addition, Belgium (Flemish Community), Ireland, Austria and the Netherlands generously contributed financial support to the project.

This collaborative effort resulted in an instrument for assessing general pedagogical knowledge (GPK), which combines elements of existing instruments with a new set of items created exclusively for the study. The GPK assessment was administered through a survey tool in five countries, along with a background questionnaire focused on learning opportunities in initial teacher education and professional development, as well as motivation constructs and self-reported indicators of instructional quality (see Annex III.).

Sampling and data collection

The first phase of ITEL's empirical work aimed to validate the assessment instrument. Consequently, data collection was based on a convenience sample (Heeringa, West and Berglund, 2010, Ferber, 1977) of 100 respondents each from three different groups: a) teachers, b) teacher candidates, and c) teacher educators. This sample size gave sufficient statistical power to the analyses conducted and allowed for exploration of the instrument's analytical potential. The resultant findings will be used to generate hypotheses that can be tested in a larger-scale study with an expanded scope of participating countries.

A sampling framework was developed for each of the three teacher groups, containing a set of requirements intended to ensure comparability across different country samples. In case specifications of the core sample could not be fulfilled, countries could apply "national options" to obtain enough respondents. Each country submitted a sampling spreadsheet outlining the sampling ratio from the core and national options. The sampling criteria also contained two institutional requirements: 1) teacher educators had to be recruited from the same institution where the teacher candidates had been trained and 2) teachers had to be recruited from public schools.

Table 2.1. Sampling framework - Individual level criteria

Group	Core sample	National option
Teacher candidates	• in final year of training • studying to be maths, science or mother tongue ISCED level 2 teachers • graduating not earlier than June 2016	• first year teachers of maths, science or mother tongue at ISCED level 2
Teachers	• 5-15 years of teaching experience • teaching at least 50% of full-time hours • teaching maths, science or mother tongue at ISCED level 2	• 20 or more years of teaching experience
Teacher educators	• teaching at least one required course in general pedagogy • not instructors in teaching methods (or didactics) of a specific subject nor subject content courses • instructors who are teaching or taught pre-service candidates in the last 12 months • PhD attained • instructors of pre-service teacher candidates at a university or teacher education college/institution and training to teach at ISCED level 2	• instructors without a PhD • instructors who taught previously, but not during the last 12 months • instructors who teach subject didactics in maths, mother tongue or science (teaching methods for a specific subject) • school-based educators (e.g. mentors, induction supervisors)

Table 2.2. Courses taught by teacher educators

History of education and educational systems	Historical development of the national and international systems
Philosophy of education	Ethics, values, theory of knowledge, legal issues
Sociology of education	Purpose and function of education in society, organisation of current educational systems, social conditions of education, diversity, educational reform
Educational psychology	Learning and motivational theories, child development (cognitive, motivational, emotional)
Theories of schooling	Goals of schooling, the role of the teacher, curriculum theory and development, didactic/teaching models, teacher-pupil relations, school administration and leadership
Methods of educational research	Interpretation and use of 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	Adaptive teaching for pupils of different backgrounds and abilities, use of resources to support instruction, manage classrooms, and communicate with parents

Assessment data

The TKS was implemented online through a commercial survey platform (FluidSurveys) from April to June 2016. Data confidentiality and anonymity were assured by decoupling the respondents' IP address from the database upon survey completion. Countries were responsible for translating the instrument to the national language, and verification was conducted by an independent third party to ensure equivalency with the English master version. Table 2.3 shows the final sample sizes.

Table 2.3. Final sample sizes

Country	Teacher candidates	Teachers	Teacher educators	National option
Estonia	257	366	109	Teachers, teacher educators
Israel	139	228	52	
Slovak Republic	107	148	105	Teachers, teacher educators
Hungary	69	107	39	All samples
Greece	72	94	56	

Institutional and system level data

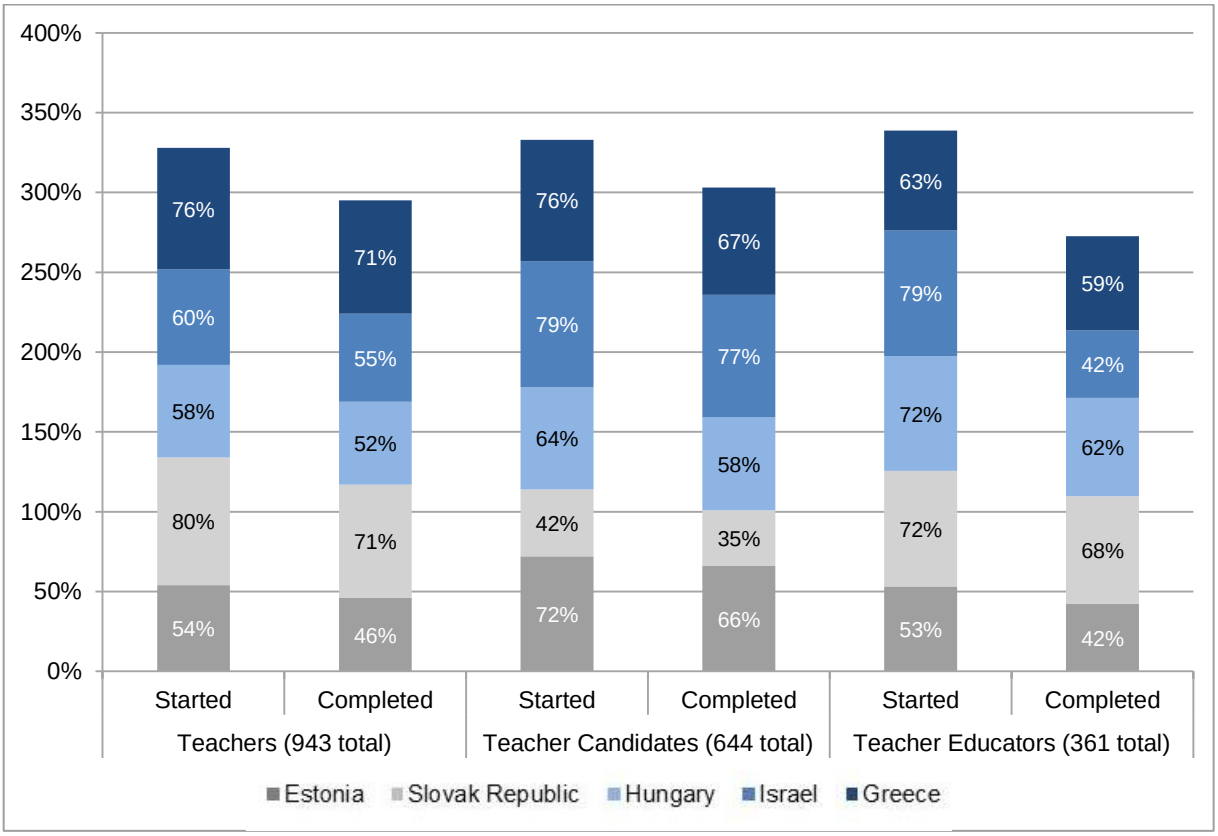
In order to contextualise the teacher education environment in participating countries or regions, both system and institutional-level data were collected. International and national documents describing the teacher education system were used to gain insight into the teaching workforce. An Institutional Questionnaire was administered to collect data about teacher education programme(s) at the institution from which the teacher candidates and teacher educators were sampled.

The online questionnaire was completed by 9 institutions – 2 in Estonia, 2 in Hungary, 2 in Israel and 3 in the Slovak Republic. Following completion of the online questionnaire, semi-structured interviews were conducted with a key informant from each institution - typically the head of the teacher education programme (9 interviews altogether). An additional interview was conducted with an independent expert in Greece on the country's teacher education system.

The questionnaires and interviews provide data on the governance and organisation of initial teacher education, entry and completion requirements, selection policies, programme content, field experience of teacher candidates, profiles of the teacher educator staff, and further training options for to graduates. The interviews also highlight the main strengths and weaknesses of the teacher education programmes. Where relevant, they contain information on historical, social or cultural factors such as recent reforms, topics of current interest and challenges directly affecting teacher learning.

Figure 2.1 shows the survey completion rate of the teachers, teacher candidates and teacher educators by country. Respondents were given 60 minutes to complete the assessment, and completion time was also registered. The completion rate, which shows the proportion of respondents who completed the assessment, corresponds to that of similar studies (Heeringa, West and Berglund, 2010). Overall across countries, there was attrition in all three samples, with slightly over 60% of respondents reaching the final assessment. Around 50% completed the assessment portion. Teacher candidates had the highest completion rate of 62%. However, it must be noted that in completing and submitting the assessment, respondents may not have answered all the questions. Hence, in subsequent analyses of profiles, missing data is treated as missing and no imputation is made.

Figure 2.1. Completion of the assessment by sample and by country



Validation of the assessment framework

The theoretical validation (see Chapter 1) generated 52 items for the data collection of this pilot study. These items were empirically validated through item response theory (IRT) scaling with a one-parameter logistic (1PL) model (Rasch, 1960, DeMars, 2010, Embretson and Reise, 2000), using the software package Mplus. In the current phase, IRT scaling was carried out in the teacher and teacher candidate samples. The teacher educator samples tended to be smaller with lower rates of response, and did not reach the minimum sample size of 100 required for a 1 parameter IRT model (DeMars, 2010).

Given the small sample sizes, it was not possible to test the full multi-dimensional construct with 3 broad and 6 sub-dimensions, although both 3 and 6 factor nested confirmatory factor analysis (CFA) models were run in the initial phase of the analyses. The theoretical validation categorised items mutually exclusively into the three broad dimensions; Instructional process, Learning process and Assessment. The data were tested separately for these broad categories, pooled and by country, as sample sizes were not conducive to fit a multi-group model. The validation procedure at this point focused on the IRT analyses, and the difficulty differentiation of the 52 items. The overall construct, the interrelatedness between dimensions through confirmatory factor analyses will be examined in a future study with representative samples, through the alignment method of IRT models in multigroup confirmatory factor analyses (MCFA) (Muthén and Asparouhow, 2014).

In the current study, 1PL models were fitted through maximum likelihood estimation (ML) as well as weighted least square (WLSMV) estimation. The former was selected for reporting due to its

full information approach, better suited for small samples (Beauducel and Herzberg 2006). Scale reliability through Cronbach's Alpha test (Acock, 2013) was also conducted along with the three broad dimensions by sample and country. The alpha coefficient is a measure of the scales' internal consistency and depends on the average covariance of the items and the number of items. Data suggests that while a few scales reached an ideal level above 0.7, the majority of the tests show a moderate level of scale reliability of 0.5-0.6 (Annex IV).

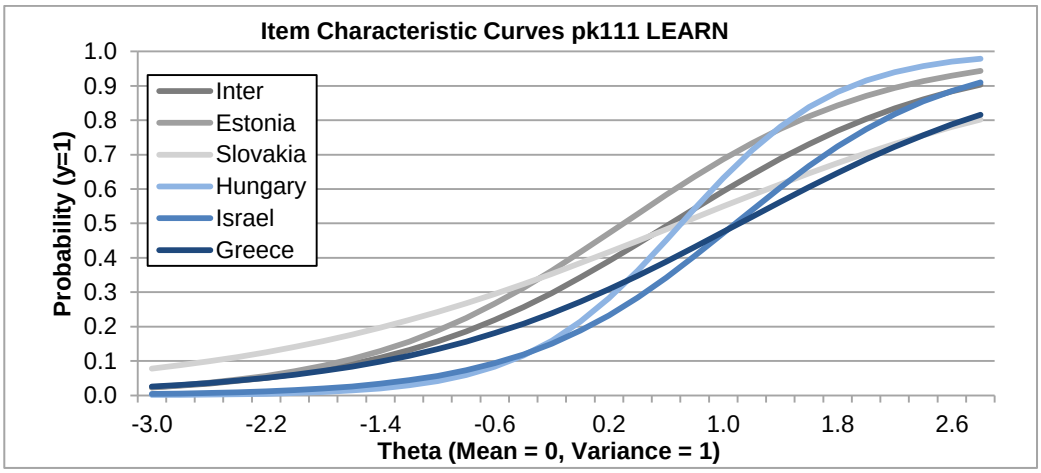
The validation of the instrument generated three clusters of items measuring GPK. The first and largest group consisted of items where the IRT scaling resulted in satisfactory differentiation in item difficulty and a similar pattern of psychometric properties across countries. These items can be carried forward for use in a larger sample. The second group of items showed less convincing differentiation in item difficulty, as well as inconsistent findings across countries. It will thus need further refinement before it can be used. A third, smaller group of items had to be excluded from the IRT scaling due to no variation in one or several of the five countries (participants provided all correct or all incorrect responses to these items). The latter two item clusters will need to be analysed further, as there may for example be bias due to translation, verification, and terminology, which will require improvement in order to accommodate an international comparison. Every item developed for the pilot study will be kept for potential use in future studies, with problematic items potentially undergoing revision.

All analyses of the TKS items used 1PL IRT models. This type of model describes, in probabilistic terms, the strength of the relationship between an individual's response to a survey question and the level of a latent variable (theta θ) being measured by the scale. In this context it refers to the probability of answering an item correctly, given a certain level of a latent trait of proficiency. Another area where IRT models are applied is public health and medical statistics, for example in measuring the probability of reporting somatic symptoms given a latent trait of depression. The objective of these analyses was to examine the properties of each GPK item by estimating properties that describe the participants' performance, and how well an item discriminates between respondents below and above the item threshold (in this case between high and low ability). This relationship was illustrated through Item Characteristic Curves (ICC) with predictive probabilities calculated from the difficulty estimates generated from the models.

Figure 2.2 shows an ICC from the first group of items (with satisfactory characteristics) on the topic "key demands for the 21st century" within the learning process dimension. A 1PL model illustrates how well the item differentiates between high- and low ability teachers. Theta (X-axis) represents the latent ability in standardised values, b is the estimated difficulty coefficient and P (Y-axis) is the probability of solving a given item at different points on the proficiency scale. Please note that due to the testing of country-specific models and not multigroup, caution in terms of direct comparison must be taken into account when interpreting the findings.

Group 1 items:

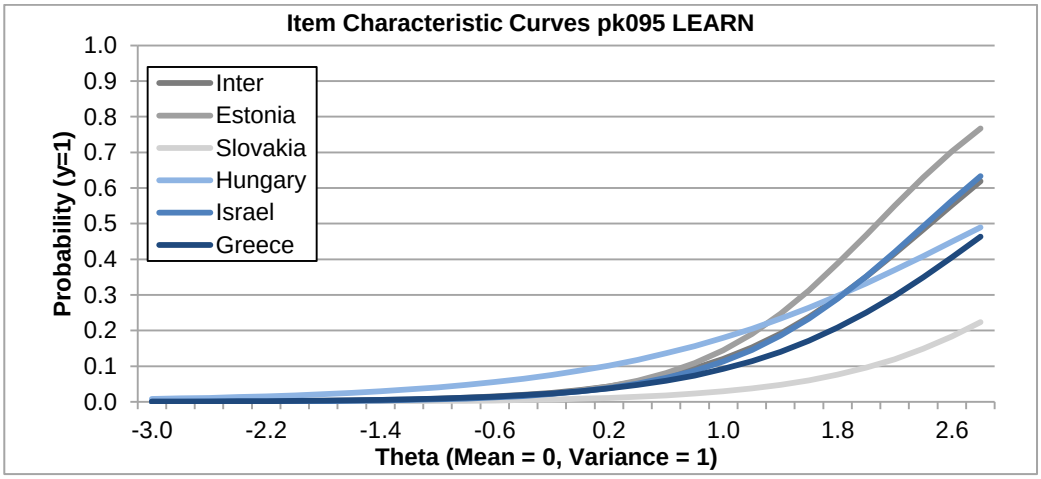
Figure 2.2. Item characteristic curve example of Group 1: Satisfactory differentiation in teacher candidate sample



Note: Inter: International

The slope, or steepness, of the ICC indicates how well a given item differentiates between individuals with higher versus lower levels of ability. A very steep slope would indicate that only the most skilled teachers were able to answer the most difficult items correctly. At the lower end of the proficiency scale (x-axis), the probability of answering items correctly is low but increases along the proficiency scale. When an item differentiates well, it is answered correctly only by the relatively high-ability teachers, thus forming the s-shape of the curve (the relationship is most often non-linear). Item pk111 is an example from the first group that differentiates well in terms of item difficulty. Low ability teachers have a low probability of answering correctly and high-ability teachers have a high probability.

Figure 2.3. Item characteristic curve example of Group 2: Poor differentiation in teacher sample



Note: Inter: International

However, when an item does not differentiate difficulty well, then the ICC will be flat, as shown in Figure 2.3, which also illustrates an item stemming from 21st century key demands. The flat ICC

indicates that the probability of answering the items correctly is consistently low along the proficiency scale. It may have been a particularly difficult item to answer, or perhaps the item had been answered correctly by a proportion of respondents who may not have been the most knowledgeable teachers: for example, perhaps they simply guessed correctly. Poor differentiation in difficulty can also be illustrated with a line in the upper end of the ICC graph, indicating that the item was answered correctly by both high and low ability teachers.

Group 3 items:

As aforementioned, the third small set of items was not included due to lack of variation in all three samples: teachers (3 items), teacher candidates (3 items), and teacher educators (6 items). Table 2.4 shows two items from the teacher sample. The first, pk124, which fell within the topic of creative thinking as part of key demands for 21st century teaching, was solved by a very high proportion of respondents. In two countries, all responded correctly. Pk039 on the other hand, a component of core knowledge, had a larger variation – in one country none of the respondents answered correctly.

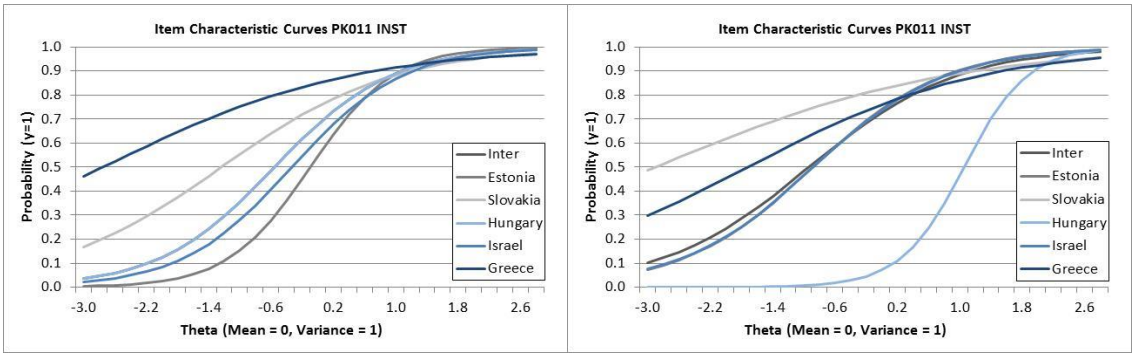
Table 2.4. Example of Group 3 items in the teacher sample

Country	Item pk124 *21st century demands*	Item pk039 *Core knowledge*
Greece	100.0	34.9
Estonia	99.7	21.3
Israel	99.1	68.7
Hungary	99.1	58.1
Slovak Republic	100.0	0.0

The differentiation between Group 1 and 2 is based on a common pattern across countries for teachers at the lower end of the proficiency scale to have a probability below 0.5 for scoring the item correct, in combination with teachers in the upper end of the proficiency scale to have a probability above 0.5. Items that do not show this differentiation in difficulty were categorised into Group 2. Some items in Group 1 had a less satisfactory differentiation, particularly in cases from Greece and the Slovak Republic, which deviated from the pattern by showing a low probability for solving the items in the upper end of the proficiency scale. Notably, Greece had sample sizes lower than 100 both for teachers and teacher candidates, indicating that this deviation from pattern may also have been due to imprecise parameter estimation, and will require further examination. These items are therefore included in Group 1 if remaining countries fulfil the criteria, and will be examined again in a larger sample. In a limited number of cases, deviation from nonconformity with the criteria also appears in Estonia and Hungary; however, the pattern is most pronounced in Greece and the Slovak Republic in both investigated samples.

A synthesis of the validation reveals **Assessment** to be the dimension that needs most development. A pattern found in Groups 1 and 2 shows that several items had poor differentiation in difficulty, wherein both low and high skilled teachers answered the items correctly (see Table 2.5 for an overview). **Instructional process** is the dimension with the best differentiation in difficulty across countries. Only one item differed between the two samples: pk011 on core knowledge, for which more development is needed in the teacher candidate sample. Figure 2.4 depicts the ICCs of this item for both the teacher and teacher candidate samples. With the exception of Greece, which deviates from the pattern, the teacher sample had satisfactory differentiation in difficulty. Teachers at the lower end of the proficiency scale had a probability of under 0.2 of answering the items correctly, whereas teachers in the higher end had a probability very close to 1.0. In the teacher candidate sample, the item worked well in Hungary, yet there was inconsistency across countries and in an unidentified model in Estonia.

Figure 2.4. Item as part of core knowledge on teacher sample (left) and teacher candidate sample (right)

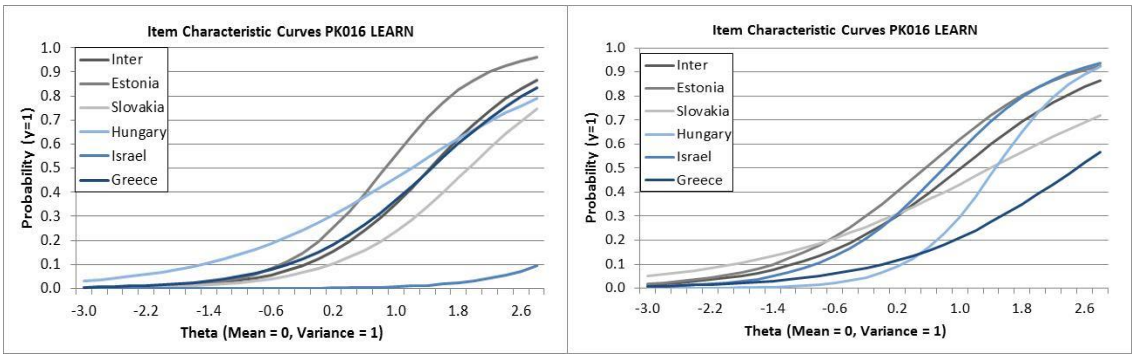


Note: Inter: International

A small number of other items do not differ between the teacher and teacher candidate samples but still require more work (for example, pk004, which appears to be too difficult in both samples[6]).

In the **Learning process** dimension, about half of items in the teacher sample need development; in contrast, in the teacher candidate sample, 12 out of 15 items can be used directly in future research. For example, in pk016 (part of key demands for 21st century, see Figure 2.5), Israel deviates markedly from the pattern and not even high skilled teachers had a probability higher than 0.1 of answering the item correctly. However, for teacher candidates the item differentiation is satisfactory across all countries, although again, Greece shows deviation for several other items. This may have to do with the small sample size and will need to be tested further.

Figure 2.5. Item as part of 21st century key demands in teacher sample (left) and teacher candidate sample (right)



Note: Inter: International

[6] The item has worked well in previous studies (Lauermann and König, 2016), so these results may be due to difficulties in translation, or, as a complex multiple choice, it may also be that one response category that is more problematic than another. This will be investigated in further content analyses.

Table 2.5. Validation - Teacher and teacher candidate samples

		Teacher sample	Teacher candidate sample
Dimension	**Sub-dimension**	**Validation results (# of items)**	
Profiles of instructional processes	Teaching methods and lesson planning	12	12
		1	1
	Classroom management	5	4
			1
Profiles of learning processes	Motivational-affective dispositions	4	6
		2	
	Learning and development	4	6
		4	1
		1	2
Profiles of assessment	Evaluation and diagnostic procedures	5	8
		7	
		1	5
	Data use and research literacy	3	3
		2	2
		1	1

Group 1: Ready for a future large-scale study
Group 2: Included in the model but with poor fit (ready for content analyses)
Group 3: Excluded due to no variation in one or several countries (ready for content analyses)

As required by the sampling framework, teacher educators participating in the study were sampled from the same institutions as were teacher candidates. Although the sample size of teacher educators needs to be expanded in future studies, initial results suggest that teacher educators' scores from the assessment align with those of the teacher candidates. For the majority of items that differentiate well in terms of difficulty, a high proportion of teacher educators responded correctly. A pattern also emerged for items that were considered difficult on the proficiency scale, wherein a lower proportion of teacher educators were able to answer correctly, indicating that the concept may not be taught in the country or could be difficult to align with national terminology.

Table 2.6. Summary of items in groups 2 and 3, by thematic orientation and type of knowledge

Group 2 and 3 items		
Thematic orientation	Type of knowledge	# of item(s)
Theoretical/scientific	Core knowledge	9
		3
	21st key demand	3
		1
Practice-based	21st key demand	6
	Core knowledge	1
	Core knowledge	1

Group 2: Included in the model but with poor fit (ready for content analyses)
Group 3: Excluded due to no variation in one or several countries (ready for content analyses)

A central motive of the ITEL TKS is to explore whether teachers' knowledge base is up to date. In the assessment, half of the items correspond to core pedagogical knowledge and the other half to pedagogical knowledge related to 21st century competences. The validation shows that the assessment has generally succeeded in evaluating the latter (Table 2.6). In addition, slightly more of the items requiring content analysis are theoretical/scientific rather than practice-based. This may indicate that theoretical concepts are more challenging than practice-based items to translate across countries, given that the literature and theoretical orientation of teacher education may differ. Hence, practice-based items may be better suited for cross-country comparison.

Summary of methodological considerations and recommendations

The pilot study of the ITEL TKS has brought forward some methodological considerations as well as a set of recommendations to assist further development of the instrument.

Identify and analyse sources of missing data

The pilot study has approximately 50% missing data; however, given the small sample sizes, no imputation was made. Utilising a nationally representative sample in the future will allow for better handling of the missing data, as it would provide justification for imputation. It would also be useful to obtain more information on the sources of missing data – for example, through survey software that provides page-tracking and information on how much time is spent on each question, both of which are essential features in identifying reasons for non-response in the assessment data. Given that attrition occurred throughout the process, with the majority of drop-outs taking place during the final assessment stage, we can attribute some of the missing data to decreased motivation, and infer that the task may have been too time-consuming for teachers with many conflicting demands.

However, we can also posit that some of the missing data stemmed from the respondent not knowing answers to the questions. In the pilot study, it was only possible to track by page and not by question. This means that it is possible to see if the respondent had visited the assessment page, but not whether all questions had been viewed. We cannot be fully sure about the reason whether the missing value is because the respondent did not know the answer, or that the person would have known the answer but was not motivated enough to continue throughout the assessment. Naturally there can be many factors behind drop-out and it does not all have to do with motivation. If future studies were to use a software that tracks time spent per question, the instances in which a non-response which was due to a lack of knowledge rather than motivational factors would be clearer. Differentiating between the types of missing data will be important to assessing teachers' pedagogical knowledge, and as such, a survey tool that grants these capabilities will advance the resultant analyses.

The pilot survey also tested a set of response-style questions to be analysed together with the knowledge items, as these items can provide useful information on how teachers approach the knowledge item. The following items on response style were used: 1) "When answering the questions, I relied only on knowledge that I already had"; 2) "In order to provide an answer, I looked up answers online or in other sources when I was not sure about the correct response"; 3) "I had to guess in order to provide some of the answers"; and 4) "I did my best to provide the most accurate answer". The sum scores on different scales of the knowledge assessment may be related to differences in responding to these style questions and this is also a useful component in understanding teachers' knowledge as well as in identifying the gaps.

For example, we can assume that for instructional processes, experienced teachers will respond that they rely more on knowledge they already have, as compared to teacher candidates. The extent to which respondents guess the answers may also differ across different scales of the knowledge assessment. The current assessment was restricted to 60 minutes and thus designed to prevent respondents from looking up answers online. As a high proportion of those who started the assessment also completed it (see Figure 2.1), it is unlikely that time was spent researching answers online. All response-style questions were located at the end of the survey (on the final page before submission) and are most likely to have been answered by those who completed the assessment. Due to limited space, the relationship between knowledge and response style is given limited focus in the current report. These aspects could be elaborated upon in a large-scale study. However, for users of the pilot data, the study already allows for analyses of the assessment data in relation to the response-style questions on by country as well as by sample.

Account for interdependence in the multi-dimensional items

For consistency in the validation phase, both multiple-choice items (37) and complex multiple-choice items (15) were coded similarly with binary variables. For complex multiple-choice items, respondents in the ITEL TKS had to answer each component correctly to score 1 point, in contrast to the alternative scoring model that allows for partial credit (Masters, 1982). Future work should more specifically account for the interdependence of the complex multiple-choice items, and further investigation will be made into whether the single answer option may have been problematic. To illustrate, suppose that the correct answer options were: A, B, D, and that many teachers correctly chose A and B, but none chose D. This scenario would result in zero variance for this item, even though teachers clearly differentiate quite well between answer choices A and B. Nevertheless, results from the validation suggest that items that high and low skilled teachers had difficulty answering came from both simple and complex multiple-choice. Consequently, in the next phase of this study, we will also examine whether simple multiple choice or complex multiple choice is the most suitable mode for different types of questions.

Allow for a discrimination parameter to vary in 2PL IRT model and fit multi-group models

Using a small sample, particularly when analysing country by country, only allows for a one-parameter IRT model. However, the validation analyses revealed that there could be need for testing a 2PL model as well, in order to better understand the psychometric structure of the assessment instrument. A 1PL model assumes that all items that belong to a given scale (e.g. instructional process) have the same discrimination parameter (i.e. slope parameter or factor loading); that is, their ICCs are equally steep and must be parallel to each other. In contrast, a 2PL model would enable the items to have different slope parameters/factor loadings, thus permitting analyses of item-specific properties such that some items within the same scale could have a relatively flat ICC, in comparison to others that may have a very steep ICC and hence very good psychometric properties. Although a 1PL model has many statistically desirable qualities and is generally preferable for final statistical modelling, a 2PL model can provide useful diagnostic information in the scale development stage (e.g. in order to identify items within a given scale that may have relatively small factor loadings).

Moreover, due to the small sample sizes, the data did not allow for consistently estimating the full construct in a multi-group model across all five countries. Models were tested separately by country as well as by pooled data, and consequently, comparisons cannot be made with the same certainty as would be possible using a multi-group model. Variations in the five countries' sample sizes also precluded testing the structure of the factors through country-specific confirmatory factor analyses. The components were therefore decoupled into three broad dimensions, as this model could be consistently tested across countries. Nevertheless, within the full assessment framework, the structure of the factors and the measurement invariance remain important for understanding the interdependence and mutual influence of the components of general pedagogical knowledge. Hence, these will be further developed in subsequent sampling and data collection.

Consider how to improve triangulation analyses and sampling synergies

In some countries it was not possible to recruit 100 teacher educators for the pilot study, as the population of teacher educators in the country was smaller. Since this group is an important component of the analyses, future studies need to find ways around this limitation. One option would be to broaden the criteria for inclusion (for example, by accepting teacher educators teaching specific subjects). The study would also benefit from building further on the analytical framework of triangulation, so as to be better able to link teacher educator knowledge to the performance of teacher candidates, not only as descriptives, but also as a potential predictor. Teacher educator data could also

be analytically linked to the learning opportunities presented in training and practicum more comprehensively than was possible in the pilot phase.

Consider different forms of data collection

Future work would benefit from further study of how to best carry out the questionnaire. The Pilot Study utilised an online assessment process (OECD, 2014a) that has both pros and cons. Enlisting the targeted group was made easier by the ability to reach participants through email and provide them with flexibility in responding, particularly given the cross-country scope of the survey. Nevertheless, this approach limited control over the proceedings; for example, it was not possible to ensure that answers were not researched online. Drop-out rates are also generally higher with online assessments, where there is less accountability required. To adapt to pre-existing conditions in each country, a future study could possibly provide both online and paper versions of data collection, similar to the procedure of the Teaching and Learning International Survey (OECD, 2014b).

A pilot survey has the tendency to take longer than a regular survey due to the testing of the instruments. Statistical testing often detects poor psychometric properties in some items, which results in a reduction of the item pool. To account for this, the pilot phase therefore begins with a larger pool of items than is targeted to be included in the final set. Thus, the questionnaire is expected to be shortened in the future and could potentially apply a different order of components. The current order is: 1) background and demographics; 2) motivation components; 3) opportunities to learn component; and 4) GPK assessment and response style. Yet while originally, the general background questions and motivation was inserted early on to act as an "ice-breaker" and as a way to contextualise the knowledge of the respondent, changing the assessment to the first component may reduce drop-outs due to survey fatigue, resulting in less missing data in the instrument. The order can also be modified across groups as part of an experimental design. Lastly, the final version of the survey will be reduced to 60 minutes maximum, compared to the time-consuming 90 minutes utilised in the initial round.

CHAPTER 3: THE CONTEXT OF TEACHER EDUCATION IN THE PARTICIPATING COUNTRIES AND INSTITUTIONS

The analysis of teachers' pedagogical knowledge, their opportunities to learn and their motivational characteristics can only be interpreted accurately within the specific contexts of teacher education in the participating countries. Hence, drawing on international and national data and reports, this chapter gives a short overview of the teaching workforce, the attractiveness of the profession and aspects of teacher professionalism in these contexts. It then provides the same for initial teacher education in each country, based on data collected at the system and institutional level.

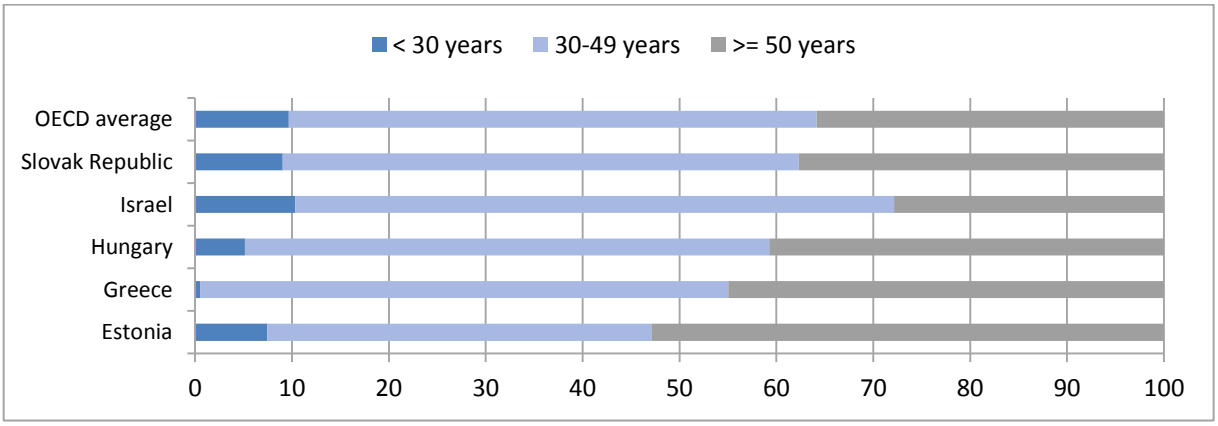
The wider context: The teaching profession in participating countries

Characteristics of the teaching profession in a country (such as demographic characteristics, specific contextual challenges and perceptions of the attractiveness of the profession) impact the recruitment, selection and retention of teachers, and thus may also indirectly affect their knowledge. In this section we give a short overview of the context of education (particularly that of the teaching profession) in the participating countries, using data available from various OECD sources, such as Education at a Glance (EAG) and the Teaching and Learning International Survey (TALIS).

The teaching workforce

Many OECD countries face an ageing teacher workforce (OECD, 2016a; 2017a), and the countries that participated in this study are no exception. In all except Israel, the share of teachers over 50 years old is higher than the OECD average of 36% (see Figure 3.1). In Estonia, more than half of all teachers fall into this age group. 10% or less of the teaching workforce in each participating country consists of individuals under the age of 30. Making the teaching profession more attractive to young people is therefore particularly relevant in these countries.

Figure 3.1. Age distribution of teachers in lower secondary education (2015); Distribution of teachers in educational institutions, by age group



Sources: OECD (2017a), Education at a Glance 2017: OECD Indicators, http://dx.doi.org/10.1787/eag-2017-en.

The ITEL TKS teacher samples also included a large proportion of teachers over the age of 50, while only a relatively small number of teachers under the age of 30 participated. This could be due to sampling requirements (i.e. teachers needed to have practiced for at least 5 years, hence respondents skewed towards an older sample; see Figure 3.2). In teacher candidate samples, there was a greater proportion of older respondents in Israel (see Figure 3.3), which is to be expected, due to the high number of "second career" teacher candidates, that is, individuals who enter teacher education programmes after having worked in various fields or attained other education or training.

Figure 3.2. Age distribution of teachers in the ITEL TKS

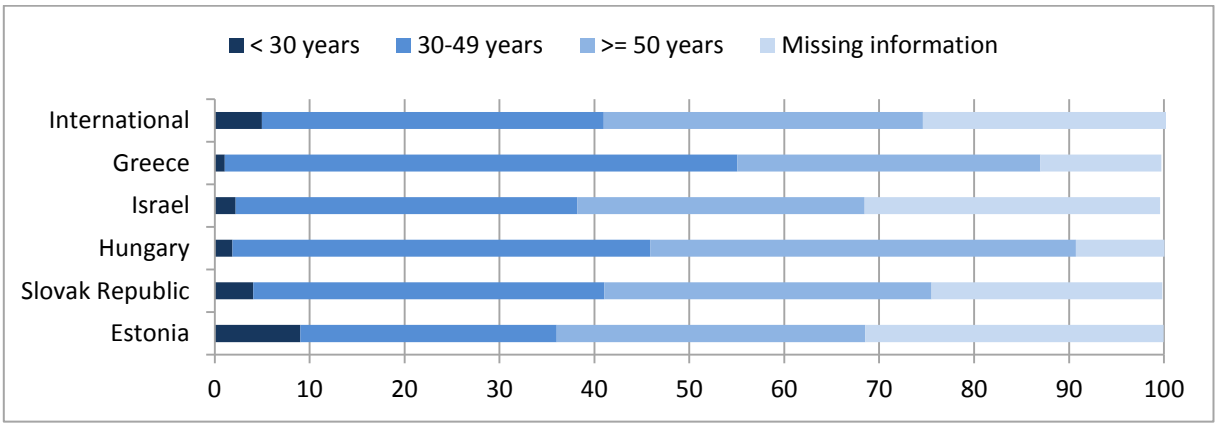
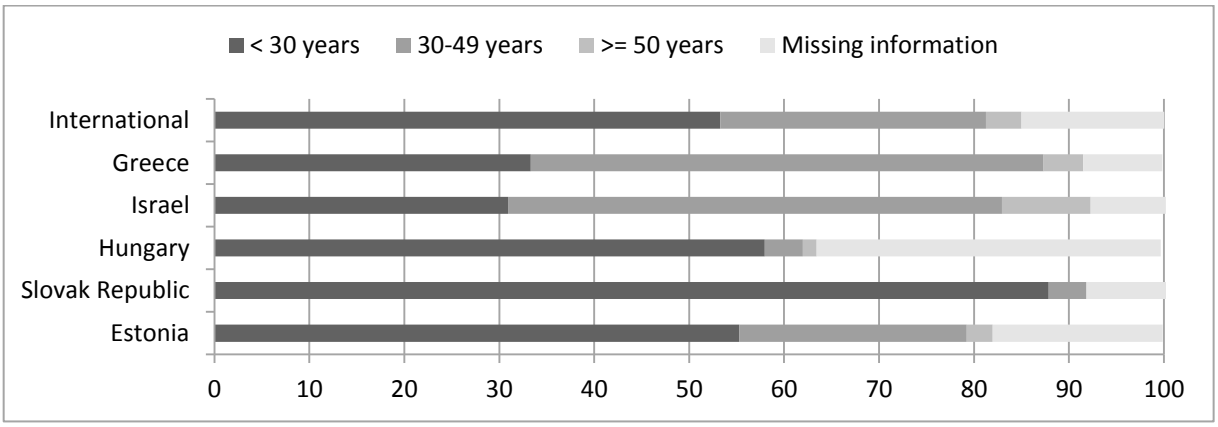


Figure 3.3. Age distribution of teacher candidates in the ITEL TKS



Among OECD countries, at least two of every three teachers are women (OECD, 2017a). This reality pertains to all levels of education, ranging from 97% in pre-primary education to 43% at the tertiary level. In lower secondary education, about 69% of teachers are women. Consequently (and as in EAG and TALIS), the gender distribution of ITEL TKS participants also skews towards women, with female teachers outnumbering their male counterparts. This is consistent across countries and in both teacher and teacher candidate samples. Additionally, in Estonia, Hungary, Israel and the Slovak Republic, the proportion of female teachers in the sample is larger than the OECD average (see Figure 3.4; OECD, 2017a). However, differences might be related to sampling only mathematics, science and mother tongue language teachers, as the gender distribution may also vary depending on the subject.

Over 80% of teachers who responded to the demographic question concerning gender in Estonia, Hungary, Israel and the Slovak Republic were female (up to 91% in the Slovak Republic), while the Greek teacher sample more closely mirrored the EAG indicator, with 64% of respondents identifying

as female. Hungary, Israel and the Slovak Republic saw a slightly lower proportion of female respondents in the teacher candidate samples (see Figure 3.5).

Figure 3.4. Gender distribution of teachers in the ITEL TKS

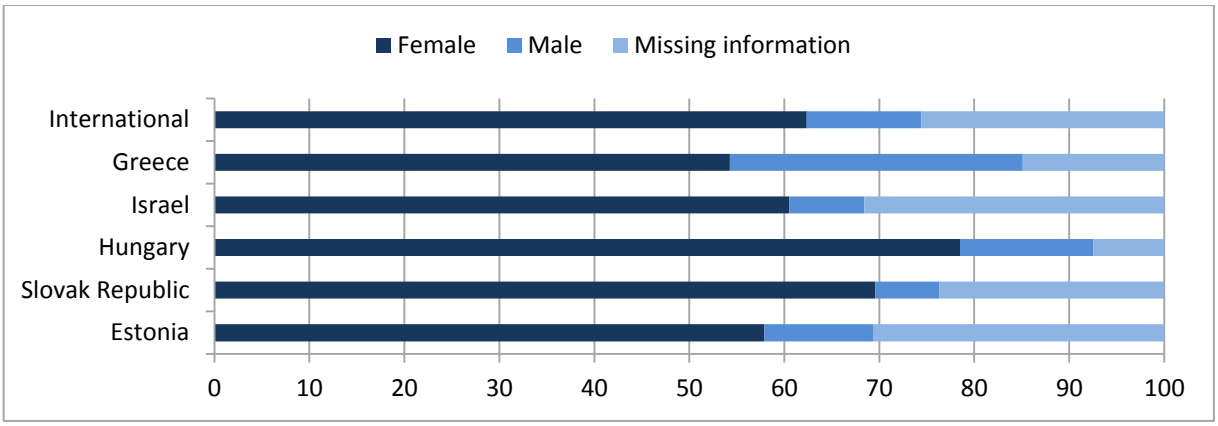
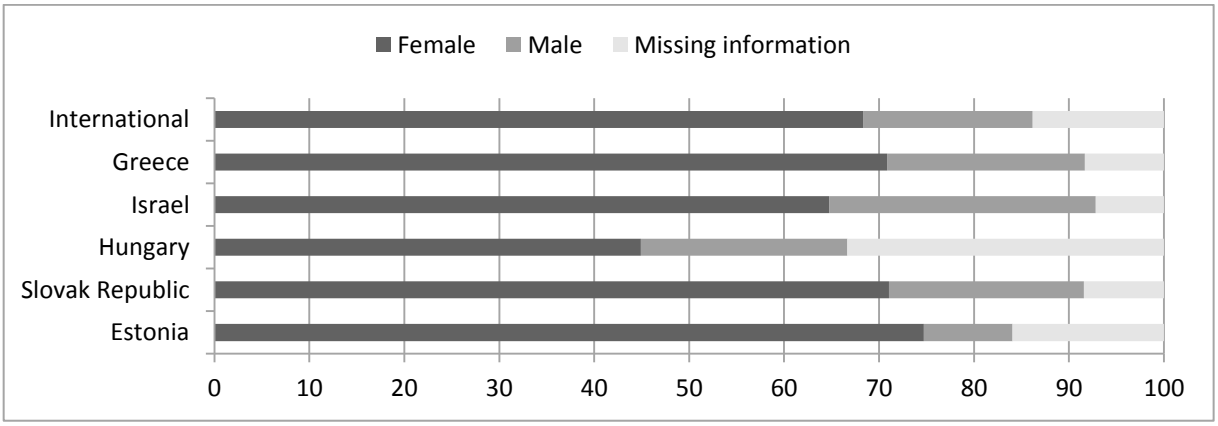


Figure 3.5. Gender distribution of teacher candidates in the ITEL TKS



Attractiveness of the teaching profession

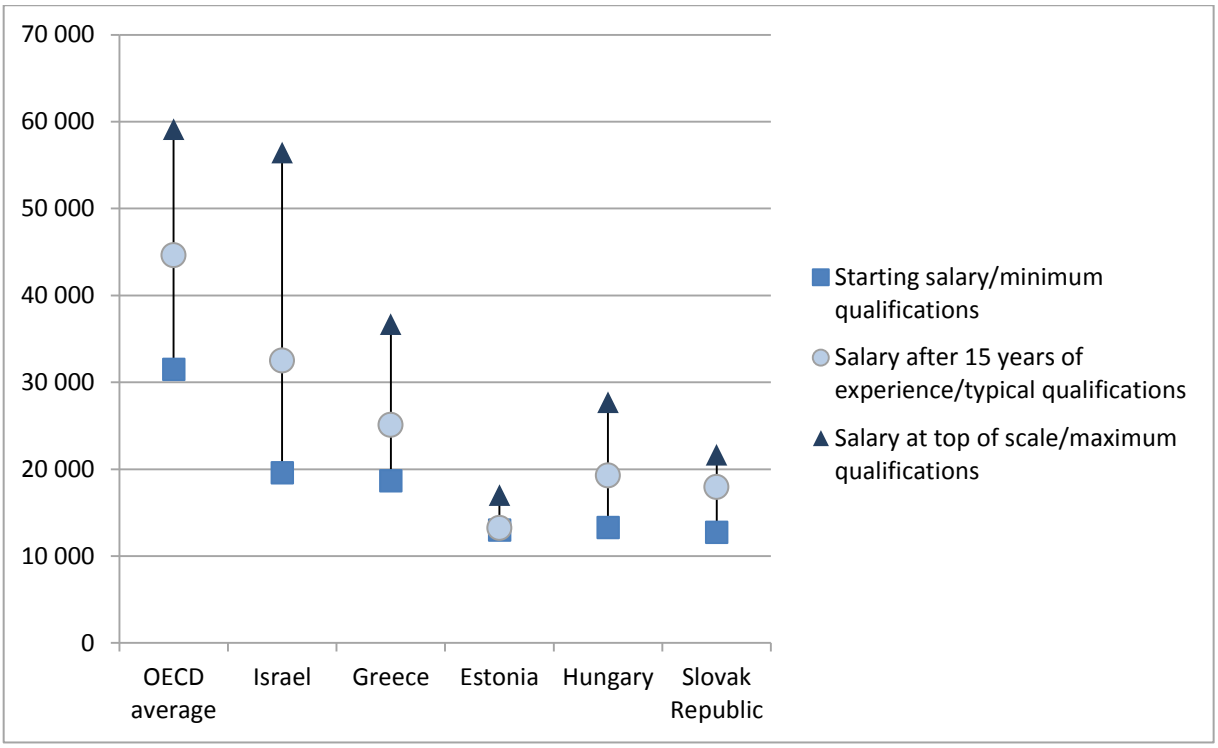
Numerous factors contribute to the attractiveness of the teaching profession, including teacher salaries, working conditions, career progression possibilities and autonomy to influence one's own work. In parallel, teachers' perceptions of their profession, such as their job satisfaction, or whether they feel that the profession is valued in their society, reflect this attractiveness.

The 2013 TALIS report reveals that while teachers are generally satisfied with their jobs, in many countries, only a small proportion feels that teaching is valued in society. Among the countries in the ITEL TKS that also participated in TALIS (Estonia, Israel and the Slovak Republic), 90% of teachers in Estonia, 94% in Israel and 89% in the Slovak Republic reported being satisfied with their jobs, yet only 14% and 4% of teachers in Estonia and the Slovak Republic respectively reported that teaching is valued in society. In contrast, teachers in Israel were more likely than the TALIS average to report that teaching is valued in society (34%).

Teachers' salaries are on average lower than earnings of tertiary-educated workers aged 25-64 in nearly all OECD countries. In the countries participating in ITEL TKS, lower secondary teachers earn less than full-time, full-year workers with tertiary education in all countries except Greece, where they

earn 6% more on average. However, there is variation: lower secondary teachers' salaries are below tertiary-educated workers' earnings by 3% in Israel, 6% in Estonia, 31% in Hungary and 38% in the Slovak Republic. Salary changes over the course of the career also differ greatly in the participating countries (Figure 3.6); however, both starting and late-career salaries are lower than the OECD average in all five participating countries (OECD, 2017a).

Figure 3.6. Lower secondary teachers' salaries at different points in their careers

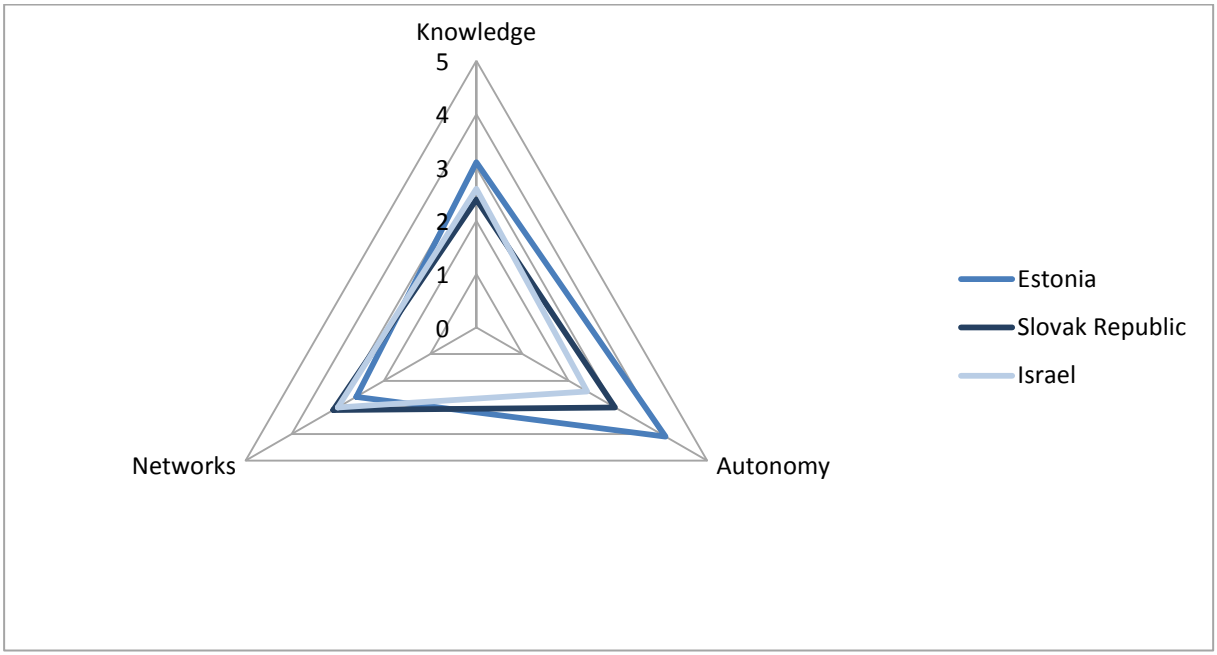


Note: Annual teachers' salaries, in public institutions, in equivalent USD converted using PPPs for private consumption. Year of reference is 2015, except for Estonia where data was only available for 2013.
Source: OECD (2017a; 2016a), Figure D3.2

Teacher professionalism

Teaching is still not unanimously considered a profession, primarily because some argue that it lacks a coherent and integrated knowledge base in which professional practice is grounded (Guerriero, 2017). TALIS data indicates variation across countries in terms of the level of autonomy that teachers have and the depth of their knowledge base and peer networks, all of which are important elements of professionalism (OECD, 2016b) (see Figure 3.7).

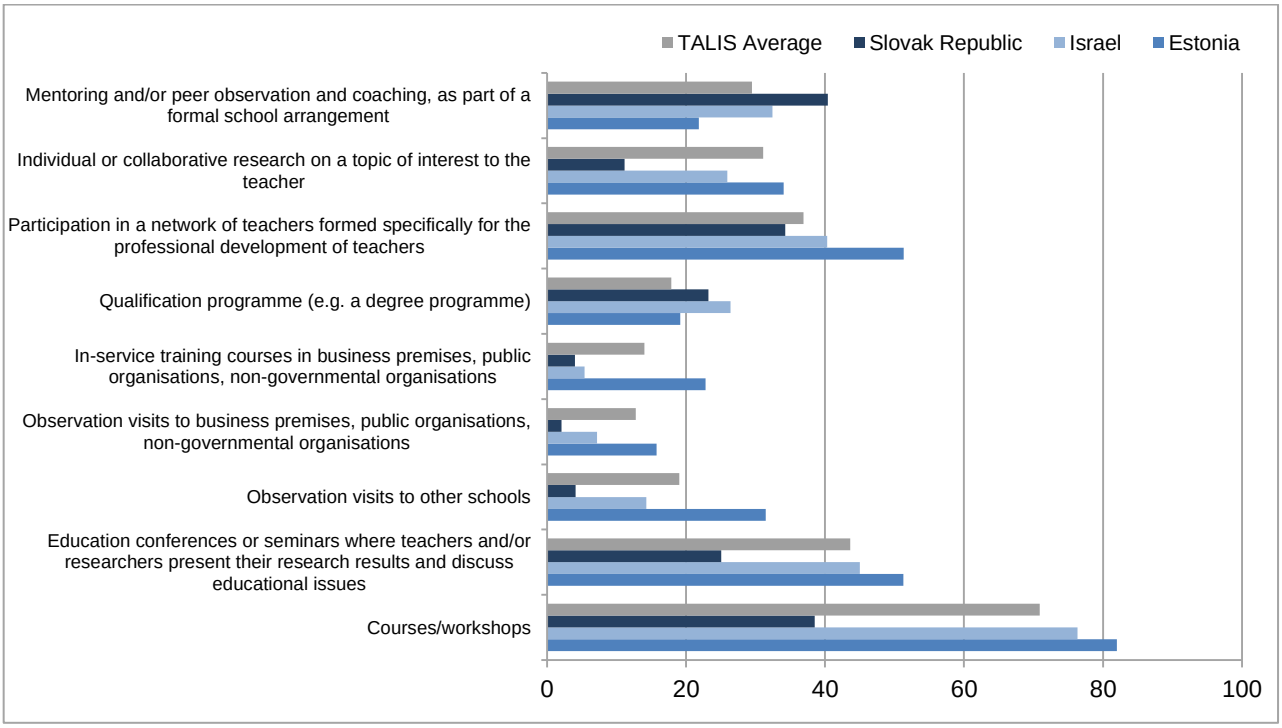
Figure 3.7. Teacher professionalism in Estonia, the Slovak Republic and Israel as measured by TALIS



Source: based on OECD (2016b), Supporting Teacher Professionalism: Insights from TALIS 2013, http://dx.doi.org/10.1787/9789264248601-en.

Not only do teachers need a robust knowledge base, but they also must update their knowledge regularly to tackle the complex challenges of their rapidly changing environments. Lifelong professional learning is a key requirement today, including professional development as well as informal settings that allow for collaboration and networking. Teachers participate in professional development to a varying extent, depending on the type of activity (Figure 3.8). For example, TALIS results suggest that teachers are generally less engaged in deep level collaboration beyond the simple exchange of materials, even though such forms have a positive impact on confidence in their teaching abilities (OECD, 2014b).

Figure 3.8. Participation in professional development activities



OECD (2014), TALIS 2013 Results: An International Perspective on Teaching and Learning, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264196261-en.

The teaching workforce, attractiveness and professionalisation of teaching all influence the development and characteristics of the profession. These issues will have an effect on recruiting and retaining high-quality individuals in teaching, and quite often are the focus of national reforms in different country contexts (see below for examples in each of the ITEL participating countries). If countries are able to elevate the attractiveness (or maintain an elevated level of attractiveness) of the teaching profession, the workforce will ideally respond to this by producing high quality, motivated and effective teachers across countries.

Teacher education at the country and institutional levels

In order to contextualise the teacher education environment in participating countries or regions, both system and institutional-level data were collected in the ITEL TKS. International and national documents and reports were used to gain insight into the teaching workforce and describe the teacher education system in the countries. In addition, an Institutional Questionnaire was administered to collect data about the teacher education programme(s) at the institution from which teacher candidates and teacher educators were sampled. The online questionnaire was completed by 10 institutions altogether in the participating countries (2 in Estonia, 2 in Hungary, 2 in Israel and 4 in the Slovak Republic). Following completion of the online questionnaire, semi-structured interviews were conducted with a key informant of the institution, typically the head of the teacher education programme (interviews in the Slovak Republic were only conducted with 3 of the 4 institutions).

This section provides a short description of participating countries' teacher education systems, including the governance and organisation of initial teacher education, entry and completion requirements, selection policies, programme content, field experience of teacher candidates and the

profiles of teacher educator staff. Where relevant, historical, social or cultural factors such as recent reforms, hot topics and challenges directly affecting teacher education are also mentioned.

Estonia

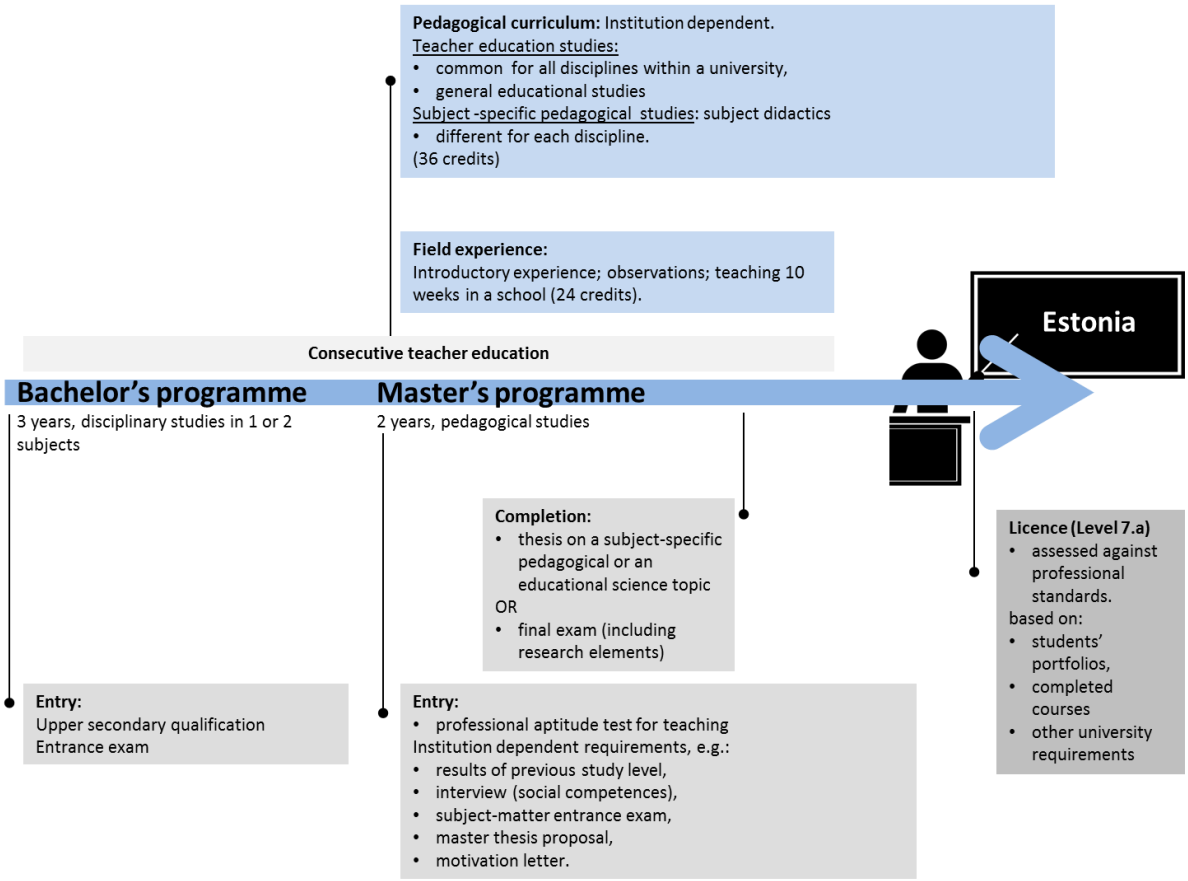
Certain Estonian studies indicate that while teachers' attitudes have shifted to a more modern conception of education, their practice is often still traditional (OECD, 2014b). Education policy in Estonia is guided by five strategic objectives, one of which is to adopt a new approach to learning (Estonian Ministry of Education and Research, 2014). Nationally-set targets (Estonian Ministry of Education and Research, 2014; Estonian Government, 2014) imply changes to teachers' practices: contemporary teaching methods are being implemented on a large scale, focusing in particular on student-centred approaches and personalised and collaborative learning.

Recent reforms include the development of a career structure for teachers, which consists of four grades, each of which reflects different levels of professional competence and experience. Alongside this, the Estonian Qualifications Authority developed professional standards for teachers, which were introduced in 2015. These standards are differentiated for the various career stages of both general and vocational education and offer clear references for assessing teachers' competence, guiding professional development and providing a basis for career advancement. Certification processes for each of the stages are conducted by the Estonian Association of Teachers (Santiago et al., 2016a), although this does not directly translate into promotion opportunities for teachers. In addition, the Estonian Qualifications Authority has evaluated the curriculum of all teacher education programmes against the new standards. Both institutions from which data was collected for the ITEL TKS have received programme approval, and are thus entitled to issue teacher qualifications. Other procedures are also foreseen to further align and update the curriculum of the programmes.

Teacher education system

The framework of teacher education requirements, such as the length of studies, number of credits required, main elements of the general pedagogy curriculum, organisation of the induction, continuing education, and teaching standards are set at the national level in Estonia by the Universities Act (Estonian Government, 1995) and two further legislations (Estonian Government, 2008; 2000). Within this framework, teacher education institutions have autonomy over their programme's emphases and curriculum, the selection of teaching materials, and the organising, monitoring and evaluating of teacher candidates' work, including field experience.

Figure 3.9. Initial teacher education for subject teachers in general education in Estonia



To become a lower or upper secondary (non-vocational) teacher in Estonia, teacher candidates must complete a consecutive programme (see Figure 3.9). Entrance requirements for the teacher education master's programme, as well as the examinations needed to complete it, vary across institutions. General pedagogical curriculum and teaching practicum requirements are the same for students of all disciplines within a university, while the specific content of the pedagogical curriculum is organised and defined by the institutions. During their field experience, teacher candidates are supported by both a university-based supervisor to oversee the process and a school-based teacher mentor to give guidance on school practices. In conjunction, candidates attend a seminar administered by the former, in order to reflect on their experiences. Both forms of support play an important role in connecting theory with practice.

Teacher educator staff

Teacher educators in Estonian universities are predominantly appointed, evaluated or promoted based on the strength of their scientific work. Certain positions require an ISCED level 8 (Doctoral or equivalent) qualification; for example, one institution reported that around half of the staff employed to teach general pedagogy courses have a doctoral degree. A certain amount of regular teaching experience is also required by legislation (Estonian Government, 2000) for higher education teaching staff providing instruction in subject-specific pedagogy. In addition, the main teacher education institutions in the country plan to establish competence centres, where courses in higher education pedagogy can be developed and provided.

The evaluation of staff varies across universities, although student questionnaires are generally used to obtain feedback on the courses offered. Both of the institutions interviewed stressed the increasing importance of teaching competence in addition to research, and reported evaluating performances every five years. Opportunities exist for teacher educator staff to undergo professional development; however, actual participation depends on individual motivation.

Greece

There have been numerous educational reforms and initiatives in Greece in recent years (OECD, 2011). However, not all of them were successful, due to resistance from teachers and other stakeholders. For example, a presidential decree (Greek Government, 2013a, 2013b) which set the grounds for introducing teacher appraisal (i.e. lower secondary teachers were to be evaluated by regional-level school advisors) was eventually abandoned for reasons including concerns as to its purpose, as well as a more general opposition towards the evaluation culture within the education system.

Teachers' pedagogical knowledge is a topic of great policy interest in Greece. A national dialogue on education launched in 2015 resulted in a number of proposals regarding the teacher education system. These included introducing a competency framework for teachers, a practice-oriented induction programme, and a consecutive teacher education model (with disciplinary bachelor's studies and a master's programme in pedagogy), which would serve as an alternative to the existing model. A report on the national dialogue process also suggested a proposal to introduce a certificate of pedagogical competence after the completion of a disciplinary degree (Greek Parliamentary Committee on Cultural and Educational Affairs, 2016). Some of these suggestions have been contested; for example, the School of Philosophy in Athens claimed that the current legislation already suffices to provide graduates with pedagogical knowledge, and hence such changes may not bring any added value (University of Athens, 2016).

Teacher education system

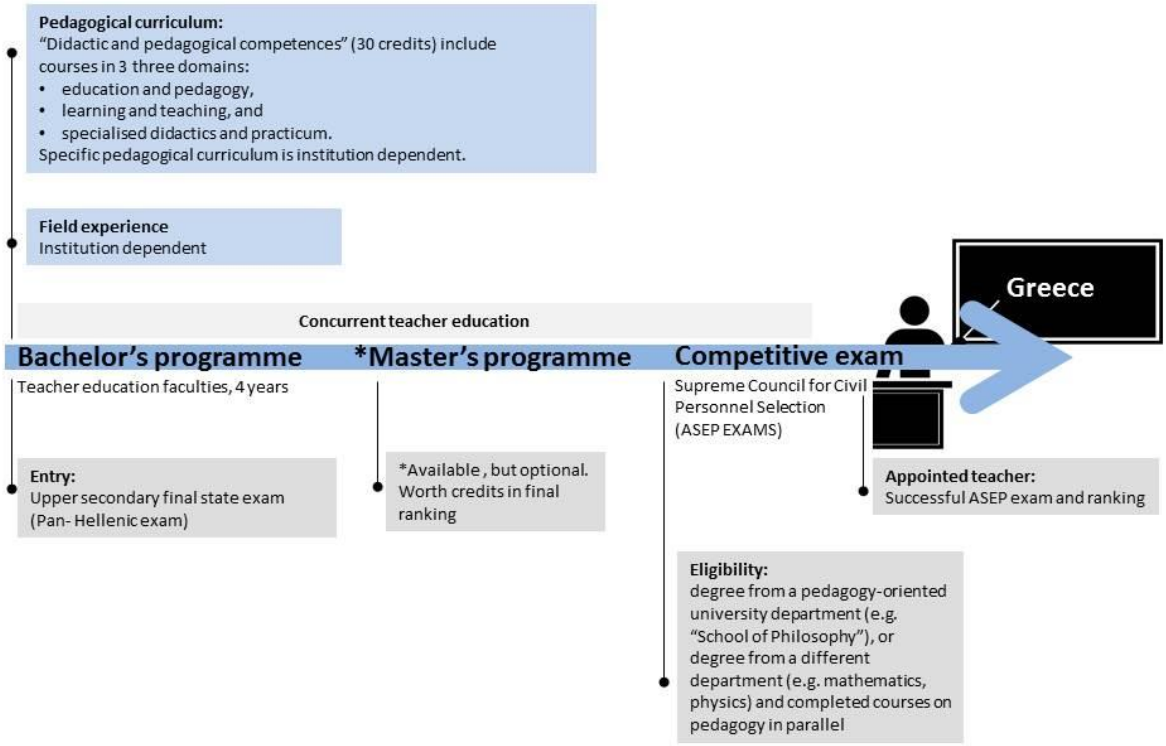
The framework of teacher education requirements, such as the duration of studies, the number of credits required and the broad topics that pedagogical training should cover, are set at the national level in Greece. Currently, nationally defined, comprehensive competence frameworks or professional standards do not exist, and teacher education institutions have autonomy to design their own curriculum and courses.

Teacher education is organised as a concurrent model at teacher education faculties (Eurypedia, 2016) (see Figure 3.10), which are university departments whose graduates are eligible to become secondary-level teachers. Students either obtain a degree from a pedagogy-oriented university department (for example, the "School of Philosophy," which includes a department of pedagogy and psychology among other disciplines), or pursue a degree from a different department (e.g. mathematics, physics) and complete courses on pedagogy in parallel. To be appointed as permanent staff or recruited as a substitute teacher[7] (with a fixed-term employment contract), eligible teacher candidates have to pass the Supreme Council for Civil Personnel Selection (ASEP) examination (Greek Government, 2010 and Greek Government, 2013a, 2013b). Employment opportunities are determined from rankings based on the results of this exam, as well as from other criteria, such as academic qualifications (for example, a master's degree contributes to one's ranking). This selection

[7] Substitute teachers are not exclusively recruited by the Supreme Council for Civil Personnel Selection; conditions for their recruitment are set by the law (Greek Government, 2010).

process has been claimed to be highly impersonal, making it difficult for teachers to build commitment to the schools in which they work (OECD, 2011).

Figure 3.10. Initial teacher education in Greece



Teacher education curriculum is designed by the universities, and consists of compulsory and elective courses. While the curriculum usually includes psychology, general and subject-specific pedagogy, and teaching practicum, the different disciplinary departments and universities place varying emphases on certain domains.

Teacher educator staff

University teachers are public servants in Greece (except for adjunct professors), and are required to have obtained an ISCED level 8 qualification. Their appointment is primarily based on the relevance of their doctoral thesis or research work to the field in which the position is based. Higher education institutions can set additional requirements, including teaching experience (Greek Government, 2011). Promotion and advancement criteria depend on a range of factors, including the rank of the staff (assistant professor, associate professor or professor) and years of experience.

Hungary

Several major educational reforms have been implemented since 2012 in Hungary, some of which directly affect teachers and teacher education. A central bureau (Klebelsberg Institution Maintenance Centre) was established in 2013, with county and district level authorities as administrators instead of local municipalities. In 2016, the bureau was split into 58 territorial centres to facilitate local decision-making. School principals and teachers are appointed and employed by the

central bureau (Hungarian Government, 2012). A quality development system, which provides a career path for teachers, was introduced in 2014. This includes regular external evaluation of teachers, school leaders and schools. Additionally, inspectorate and pedagogical services were established, and evaluator experts as well as education counsellors were formed (Hungarian Government, 2013).

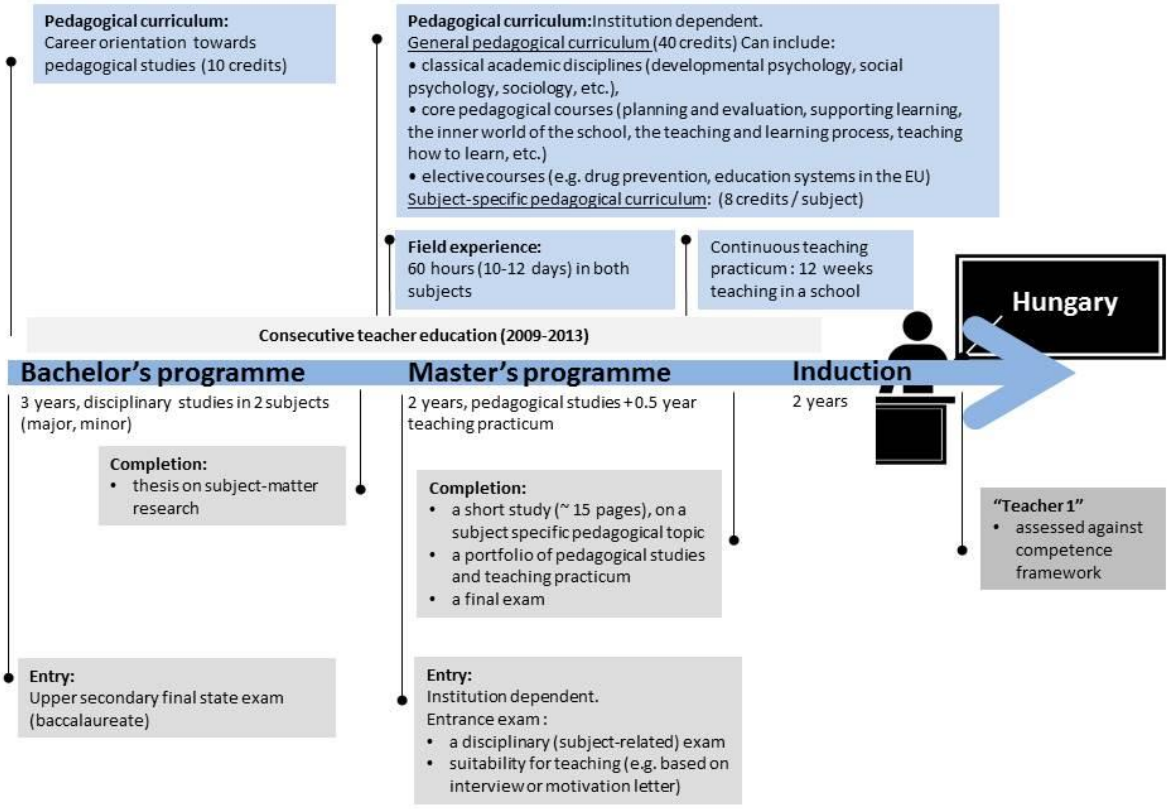
Teacher education system

Teacher education is governed at the national level in Hungary in terms of programme structure, length of training and broad programme goals. While the number of total credits required during pedagogical training and the length of the teaching practicum are set at the national level, teacher training institutions have autonomy in defining the actual content of the programme: the specific design of the curriculum – in terms of subject matter, subject-specific pedagogy and general pedagogical preparation, the choice of textbooks, and the monitoring of teacher candidates' progress. Similarly, while the broad framework of the types and content of assessments throughout the programme are set at the national level, the evaluation principles and criteria are developed by the institutions. A competency framework, which defines the competencies graduate teachers are required to have, is also described in a ministerial decree (EMMI, 2013), and each institution states its output requirements, or learning outcomes, on the basis of this framework.

During the last decade, two main structural changes took place in teacher education in Hungary. From 2006, in line with the Bologna Process, a two-cycle training process was gradually introduced, becoming widespread in the country by 2009 (Nagy, 2009). Teacher education was thus transformed into a consecutive model, which encompasses 3 years of bachelor-level subject training and 2.5 years of master-level teacher training, the last semester of which denotes teaching practicum in a school. The first teacher candidates who received their master's degree in this system graduated in January of 2013. The introduction of the model unified teacher training across the secondary level of education. While before, two different concurrent training programmes existed for teacher candidates preparing to teach at the lower secondary level (ISCED 2) (4 years of training at "teacher training colleges") and at the upper-secondary level (ISCED 3) (5 years of training at universities), in the new consecutive model, all secondary school teachers are required to have a master's degree with 5.5 years of training.

However, starting in September 2013, the one-cycle concurrent model was reintroduced. In this most recent structure, the length of training is differentiated again on the basis of the level at which teacher candidates are preparing to teach: 4+1 years for lower secondary teachers in the upper section of general primary schools, and 5+1 years for teachers teaching in a secondary school. In both cases, the extra year denotes a full year of teaching practicum in a school. These structural changes were accompanied by changes in the curriculum, wherein this time, subject-specific disciplinary content gained in importance, to the detriment of pedagogical knowledge. Teacher candidates who started their initial training in this system in 2013 were in their third year of training in 2015-16, the time of the data collection. As the ITEL sample consisted of teacher candidates in their last year of training (or exceptionally in the Hungarian sample, in their penultimate year), the vast majority of respondents were part of the two-cycle consecutive system, and hence this report focuses on describing this system (see Figure 3.11).

Figure 3.11. Initial teacher education in Hungary



Requirements to enter Master level teacher education are set at the institutional level. Selection is predominantly based on achievement in disciplinary subjects, and correspondingly, drop-out is mostly due to low achievement in the disciplinary field. While the acceptance rate is high at both of the interviewed institutions, self-selection mechanisms exist, in that candidates with a strong motivation to become a teacher are more likely to apply for a teacher education master's degree. High-achieving students at the bachelor level tend to choose a subject-related scientific master's programme, rather than teacher education, as reported by the institutions. In addition, there is a nation-wide shortage of students applying for teacher education in the natural sciences.

The specific content of teacher education curriculum is designed at the institutional level, while the frames, i.e. the number of credits in the different fields of study, are set nationally. A competency framework, which defines the required competencies students should have when they obtain their degree, is also set by national decree (EMMI, 2013), and institutions must align the content and learning outcomes of their courses to this. Teaching practicum consists of a shorter field experience during the master's studies and a semester-long continuous teaching practicum after the degree that allows students to get a sense of the entire role of teachers (e.g. through participation at staff meetings and outside school activities). A university supervisor and a school-based mentor follow and support their work. The former leads a supervisory seminar once a week, while the latter is responsible for accompanying and supporting school practices.

Teacher education staff

University teachers are public servants in Hungary, and their appointment and promotions are mostly based on their scientific work. All university teaching staff are required to have obtained an ISCED level 8 (Doctoral or equivalent level) in Hungary; however, institutions can set additional requirements for staff involved in teacher education. To illustrate, one of the institutions from which data was collected only employs staff who have a teacher education degree and teaching experience in a school, while the other has no such requirements. Although student evaluations of their teachers and courses are a widespread practice in Hungarian universities, it usually does not influence the promotion or professional development requirements of the teaching staff. While formal procedures evaluating the teaching competencies of teacher educators are not in place, informal methods exist. In one institution, teacher educators visit each other's classes and mentor young staff members, while in the other, EU funds have been used to further the development of the staff's teaching competencies.

Israel

The education system in Israel is relatively centralised under the supervision of the Ministry of Education, which determines the national curricula, including a compulsory core curriculum, and implements national and international educational testing policies. Almost all schools in the education system are public, generally divided by their language of instruction – Hebrew in the Jewish sector and Arabic in the Arab sector. Within each sector, schools are grouped under supervision frameworks, which represent different cultural and religious subsectors in Israel. Within the Jewish sector, these frameworks include secular, religious, and ultra-orthodox supervision; within the Arab sector, there are separate supervisory bodies for the Arab, the Bedouin, and the Druze populations. Teacher education is governed at the national level. In this sense, the education system is highly centralised, with the Ministry of Education responsible for administering the curriculum and standards, as well as testing, hiring and firing school staff. As of 2015-2016, 72% of lower secondary teachers worked in the Hebrew system, and almost 28% worked in the Arab system (Central Bureau of Statistics, 2016).

The Israeli education system has undergone a number of reforms in recent years. One notable example is the New Horizon reform (in Hebrew: Ofek Hadash), which was initiated in 2007 and implemented in elementary and middle schools with five main targets: promoting individual-centred teaching and learning processes, structuring teachers' work (i.e. frontal, individual and non-teaching hours), reinforcing teaching staff and school management (i.e. enhancing professional development of teachers and management personnel), empowering school principals (i.e. expanding decision-making powers relating to promotion and tenure of teachers), and evaluation performance (Israeli Ministry of Education, 2012). Specific changes related to this reform include increasing the starting salary of new teachers, flattening the growth in pay during the career progression, lengthening the working week for teachers from 30 to 36 hours (including four to five hours of small group teaching), and the establishment of a training college specifically for principals (Wolff and Breit, 2012).

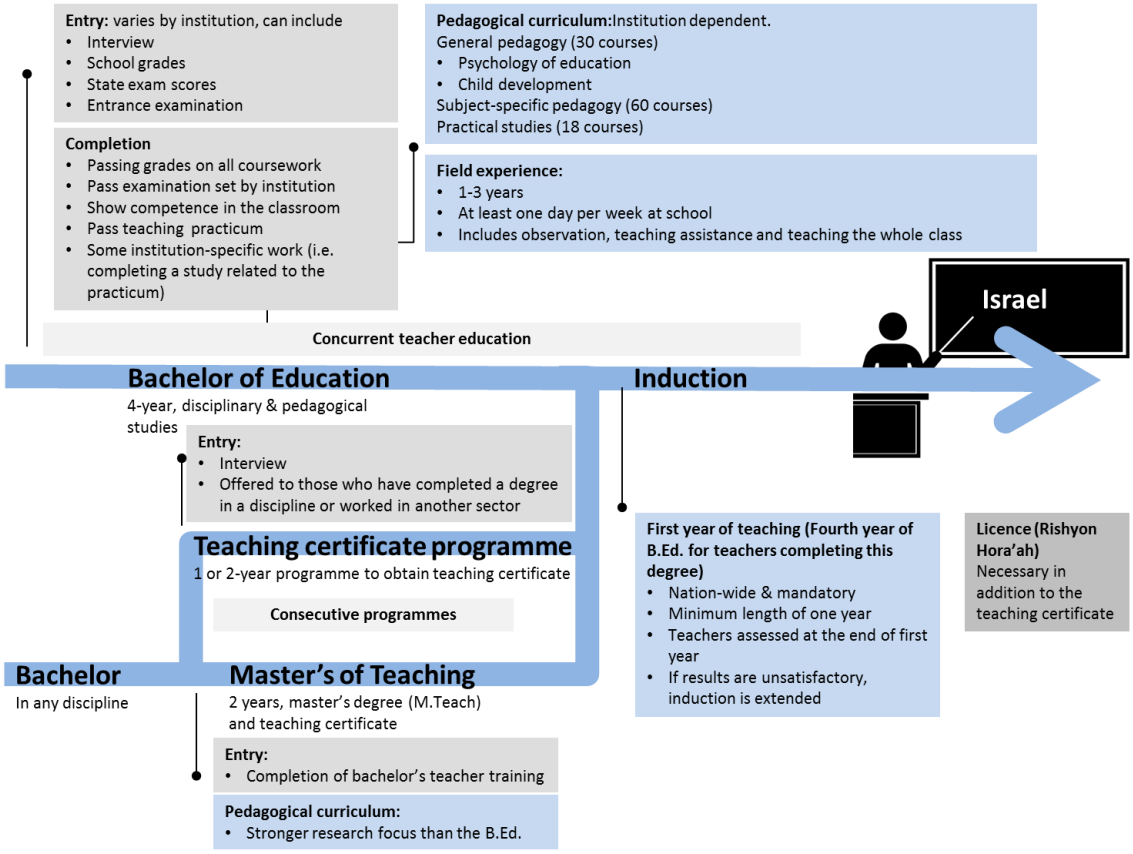
Teacher education system

Pre-primary, primary and secondary teachers follow a four-year concurrent teacher education programme at the bachelor's level, although there is an alternative consecutive route open to those who have completed a degree in a different discipline. Successful completion of the concurrent programme, which combines disciplinary and pedagogical studies, as well as teaching practicum in school, leads to a B.Ed. degree and a teaching certificate. In contrast, the consecutive programme consists of a two-year course that awards a teaching certificate. There is also the option to obtain an M.Teach (Master of Teaching) over the course of two years, which offers both a master's degree and a

teaching certificate. Teachers receive their license (Rishyon Hora'ah) – a requirement in addition to the degree and certificate – after successful completion of an induction period (see Figure 3.12).

There are a number of different programmes in Israel aiming to attract high-quality candidates into the education system, for example, the Honours programme that attracts students with high performance at the tertiary level. Changes to the funding formula for teacher training institutions under the New Horizon initiative encourage these institutions to attract high-quality students, as this brings more funding to the institution. Applications to teacher training colleges have increased over the past few years, which allows for stronger selection based on the quality of candidates (Wolff and Breit, 2012).

Figure 3.12. Initial teacher education in Israel



Entry requirements into teacher education differ depending on the institution. Acceptance rates vary, from 90% in some institutions for the concurrent programme, to 50% in others for the M.Teach. However, the curriculum across institutions is highly unified; in collaboration with the Ministry of Education, the Council of Higher Education provides set guidelines on the types of courses, number of credits devoted to content knowledge, types of pedagogical studies, and practicum. At the institutional level, national guidelines are strong, although course content can be designed and set by individual institutions within the nationally-set frames. Differences exist across colleges, with some choosing to focus on issues of multiculturalism, while others may emphasise pedagogical content knowledge. Institutions recruit their own teacher educators, and therefore the staff profile can influence the courses offered as well as content. While some completion requirements are common to all colleges (see Figure 3.12), institutions can set further requirements. In the Levinsky College of Education, for

example, aspiring teachers need to conduct a study related to the practicum, as well as write a paper consisting of a literature review that covers methods, data and analysis.

In 2015-16, a new system of teaching practicum was piloted. Under this system, first and second year teacher candidates do not gain in-school experience, but instead spend three days per week in a school during their third year, which allows them to become an integral part of the classroom. Those who enter the teaching profession must complete an induction programme, lasting up to three years. Aspiring teachers are assessed at the end of the first year to receive a teaching license; if results are unsatisfactory, a second year of induction must be completed. A subsequent assessment after the second year is required for receiving work tenure, and if results at this stage are unsatisfactory a third year must be completed.

Teacher educator staff

Staff employed to teach courses in general pedagogy, and supervise and mentor students during the teaching practicum have completed doctoral or equivalent studies (ISCED level 8), as well as a teaching qualification for primary or secondary school. Teacher educators generally hold a third degree, but can include those with only a Master's degree, although this is less common. Promotion criteria of teacher educators include quality of teaching, initiation and research activity. One of the interviewed institutions provides permanent contracts to teacher educators after three years of work, citing teaching competencies as being of large importance to promotions, in addition to research requirements. Another institution cited promotion as being dependent on production of research papers; however, for younger staff in the lower ranks, teaching matters most. Before obtaining a permanent contract, teacher educators must undergo a formal procedure involving observations by the head of the program, which are tabulated with marks given by students. As teacher educators progress through their career, other aspects of performance become important, such as curriculum development and research. Evaluation of teacher educators in both institutions is done through student feedback and observations of lessons by heads of the department.

Slovak Republic

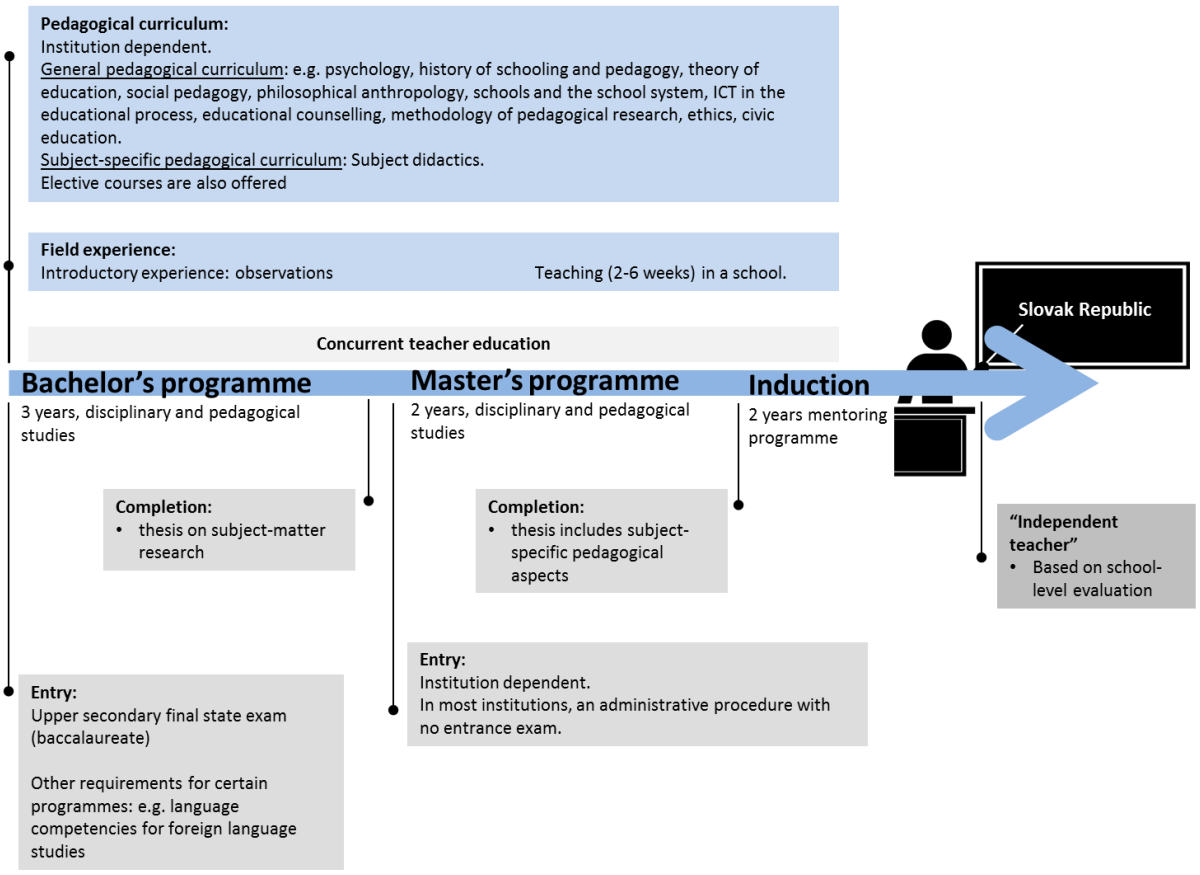
A number of reforms have been implemented over the past decade in the Slovak Republic that affect the teaching profession. Teacher salaries were increased by 5% annually over 2013-15. A new career system was introduced in 2009 (Act on Pedagogical Employees and Specialist Employees), which allows teachers to progress through four career steps, with corresponding financial rewards. This process is accompanied by a bonus system, which is based on performance or credits gained from professional development. In addition, new professional standards were developed from 2004-2014. These are differentiated for each career stage (Santiago et al., 2016b), although they have not yet been officially adopted to legislation. The School Act guarantees teachers the freedom to choose their own pedagogical methods and teaching approaches (OECD, 2015).

Teacher education system

The Slovak government sets the framework for teacher education by regulating the length of study and core themes of teacher education programmes, which are evaluated and approved every 6 years by the Accreditation Council, a part of the Ministry of Education. Universities have a large degree of autonomy in determining the number of credits and courses required for the programmes, as well as in developing the content. Aligning the content to the competencies proposed in new professional standards is an ongoing process in all institutions.

Teacher education in the Slovak Republic consists of two levels: bachelor's and master's levels (see Figure 3.13). Both levels consist of a two-subject disciplinary study that is taken alongside the general pedagogical curriculum. Classroom practice is offered at the master's level. Although rarely used, an alternative route to teacher education exists, wherein students enrol in a different study field and complete supplementary pedagogical studies, either in parallel or after completing their qualification for another field. Successful completion of both programmes lead to both professional and pedagogical qualifications (Shewbridge et al., 2014).

Figure 3.13. Initial teacher education in the Slovak Republic



Requirements for entry into teacher education are set at the institutional level. High-achieving secondary school students rarely choose to enter teacher education; hence, about 30% of students drop out at the bachelor's level. In contrast, the master's level has a nearly full completion rate.

The parameters of the teacher education curriculum are set nationally, while the specific content and number of credits are decided at the institutional level. Although in the past some institutions described their courses through syllabi (defining topics and sub-topics), nowadays, all institutions are expected to adopt a learning outcomes approach and define the competencies that should be acquired by students. The length and forms of classroom practice also vary across universities to some extent. School-based mentors support teacher candidates during classroom practice and give them feedback on their teaching. A university-based supervisor leads a seminar that accompanies the classroom practice and provides room for reflection.

Teacher educator staff

University teachers are public servants in the Slovak Republic, and consequently their appointment and promotions are mostly based on their scientific work. All university teaching staff must obtain an ISCED level 8 (Doctoral or equivalent level) qualification, although institutions can set extra requirements for staff involved in teacher education. All three institutions from which data was collected require staff providing supervision to classroom practices to have obtained a teaching qualification; one of the three also requires past teaching experience in a school.

In terms of evaluating teaching staff, student questionnaires are used in two of the institutions, and in one of them, the results are also discussed with the vice-dean. Two institutions reported not using any formal protocol, while one reported having an internal evaluation procedure. In the latter, heads of the faculty organise lesson-visits with peer observations for faculty members each semester, and then write a summary report on the peer reviews, including suggested recommendations for improvement. The exact implementation of this procedure is up to the faculty. This institution also uses a mentoring and induction scheme for young staff members, who undertake a course on university pedagogy (adult education, modern forms of instruction, preparation of study materials, IT education, e-learning, critical thinking). In the other two institutions, there are no formal requirements for professional development, although professional communities or individual staff members can engage in relevant activities. For example, in one institution, some staff members are developing their teaching skills and competencies within the framework of a European project on university pedagogy.

The bottom line

Teacher education systems differ across the countries that participated in the ITEL pilot survey, both in structure and culture. The governance and organisation of initial teacher education, entry and completion requirements, selection policies, the programme content of teacher education programmes, field experience required from teacher candidates and the profiles of teacher educator staff all influence the knowledge and skills newly qualified teachers acquire. In the pilot study the institutional questionnaire was used primarily for the contextual descriptions presented above. However, in a future large scale study, with samples that are representative of teacher education institutions, this data can also be used in quantitative analysis. In this sense, system level and institutional data can reveal important relationships between these factors and teacher candidates' pedagogical knowledge, learning opportunities and motivational competencies.

CHAPTER 4: TEACHERS' PEDAGOGICAL KNOWLEDGE

Introduction

Teachers as professionals possess highly-specialised knowledge that continually transforms as new knowledge emerges from practice and research or is shared through professional communities (Guerriero, 2017). Empirical studies show that teachers' pedagogical knowledge is related to better instructional quality (e.g. higher cognitive activation of students, better instructional pacing, better student-teacher relationships, fewer classroom disruptions, and better awareness of students' comprehension problems), as well as higher student achievement. These studies suggest that pedagogical knowledge is a key factor of teaching quality (König, 2014; König and Pflanzl, 2016). Hence, many OECD countries are prioritising improving their teacher education systems in order to improve teaching quality. This has led to a demand for the assessment of teacher knowledge as an outcome of teacher education systems, and as a predictor of effective teaching and student achievement (Guerriero, 2017).

The ITEL Teacher Knowledge Survey addresses the above areas through two key questions:

1. What is the nature of the pedagogical knowledge base of the teaching profession?

2. Is the pedagogical knowledge of the teaching profession up to date? Particularly, does the teacher knowledge base sufficiently incorporate the latest scientific research on learning?

This chapter examines each of these research questions in turn. The first section presents pedagogical knowledge profiles drawn from the ITEL TKS pilot survey and relates them to the validation results in Chapter 2. The profiles explore the strengths and weaknesses of teachers' pedagogical knowledge base in three broad areas: instructional process, learning process and assessment. Descriptions of the profiles are provided through samples of teacher candidates, teachers and teacher educators by country. Due to the small sample sizes of this pilot study, cross-country comparisons were not drawn. The chapter ends with some preliminary conclusions and recommendations for a larger-scale study with a representative sample.

Profiles of teacher knowledge

The ITEL TKS profiles are designed to provide a visual understanding of the relative strengths and weaknesses of the pedagogical knowledge base based on the dimensions and sub-dimensions of the Assessment framework (see Table 1.1 for more details):

1. Instructional Process: Teaching Methods and Lesson Planning, and Classroom Management.

2. Learning Process: Motivational-Affective Dispositions, and Learning and Development.

3. Assessment: Evaluation and Diagnostic Procedures, and Data Use and Research Literacy.

Teachers, teacher candidates and teacher educators' might be expected to possess a strong and balanced knowledge base across these three dimensions, although it is possible that priorities in teacher education systems might skew the profiles in a particular direction. The ITEL TKS assessment is designed to illustrate the relative strengths and weaknesses of the general pedagogical knowledge base, and so would reveal if the profile matched with the expectations of that particular system.

For example, if a balanced knowledge base is expected but the profile shows that there is a particular strength in one dimension, this would give an indication of what elements the system could usefully aim to strengthen. The following section sets out three distinct types of profiles that might emerge from the ITEL TKS assessment if the knowledge base is not balanced:

- *Profile: Strength in Instruction.*

The knowledge base in this profile is strongest on items relating to teaching methods, lesson planning and classroom management. This could be due both to teacher education and practical experience. While teacher candidates with this profile would be expected to possess a more theoretical knowledge of best practices for instruction, in some countries there has been a move towards more practice-oriented teacher education. As part of this, the emphasis shifted to what excellent instruction involves from a focus on core theoretical disciplines such as educational psychology (Furlong, Cochran-Smith and Brennan, 2009; Beach and Bagley, 2013).

Teacher education that is driven by a know-how approach is more likely to equip teacher candidates with a strong knowledge of instruction processes. Systems that place an emphasis on mentoring and induction may also tend to prioritise this element. Teacher educators with strength in instruction could benefit from both theoretical and practical knowledge, as well as from their own meta-knowledge and experience of how teachers and teacher candidates develop in their classes and throughout their careers.

- *Profile: Strength in Learning.*

In this instance, the knowledge base is strongest on items relating to the cognitive, motivational and emotional dispositions of students and their learning processes and development. Strength in this dimension could come from a primarily theory-based teacher education system in which the disciplines of classical developmental psychology (e.g. from Piaget, Vygotsky, etc.) and more recent cognitive sciences (e.g. the brain sciences) dominate.

Teacher candidates from those programmes would have a stronger knowledge base on students' cognitive and emotional development. For teachers, this profile could reflect ongoing professional development that is continuously updated with new evidence from the learning and brain sciences, and/or continuing PhD studies in these areas. As this dimension is highly relevant to everyday professional practices, it could also be related to individual characteristics (for example, individuals who choose to become teachers could be more likely to be curious about people and how they learn). It could reflect informal processes of learning, such as reading specialised magazines. For teacher educators, this profile might reflect those who are actively producing, using and disseminating research in the learning and brain sciences.

- *Profile: Strength in Assessment.*

The knowledge base is strongest on items relating to evaluation and diagnostic procedures as well as data use and research literacy. This could reflect the rise in accountability in education and the increasing emphasis placed on standardised student assessment and various forms of national or

regional examinations in many systems (OECD, 2013). Teachers are often under pressure to prepare students for these tests and, in some cases, this can become a major educational objective. Indeed, in TALIS 2013, teachers reported that evaluation and assessment practices are the third most common professional development topic (OECD, 2014b).

In addition, more recent learning and learner-centred pedagogies emphasise the importance of teachers' reflection on the teaching and learning process (Schön, 1983; Mulcahy, 2012), guided by a diagnosis of students' development and a constant evaluation of the efficiency of teaching. A focus on reflective teaching is likely to also place a strong emphasis on various forms of evaluation and assessment.

This dimension has two sub-dimensions, the second of which is related to data use and research literacy. Collecting, using and analysing student data, as well as interpreting and adapting research findings into practice are encouraged at the national and at the school level in some countries to improve educational effectiveness (Burns and Köster, 2016). While this is related to student assessment to a certain extent, it also reflects a distinct knowledge domain. It would be valuable to disentangle the two elements of this profile to obtain a better sense of what is driving this knowledge base and how it is reflected in practice.

Using the profiles

These profiles, if developed from representative samples, could provide useful feedback for refining policy and teacher education systems. They could help not only in identifying knowledge gaps in the current teacher workforce, but also among cohorts of teacher candidates as well as teacher educators. This last group is particularly important as it has long been understudied despite the key role it plays (OECD, 2010). The profiles can be further linked to quality of the system by examining how variations in knowledge are related to learning opportunities of teacher education, ongoing professional development, and also elements of professional competence (see Chapters 5 and 6 in this report).

It should be noted that the knowledge profiles are not intended to assess individual teachers' knowledge base, but rather help gauge the relative strength and weaknesses on the system level. They are designed to provide objective and comparable data that can be used with institutional and contextual information to help determine whether improvements need to be made to the qualifications and training of the teacher educators, the pedagogical content transmitted to teacher candidates or the content of professional development activities available to teachers.

As laid out in Table 1.1, each of the dimensions in the assessment framework is composed of two sub-dimensions (for example, Instructional Process is made up of two sub-dimensions: 1) Teaching Methods and Lesson Planning, and 2) Classroom Management). Due to the small sample sizes in the pilot this report will only cover these sub-dimensions briefly at the end of this chapter. When developed with a full sample, the relative strengths and weaknesses on the sub-dimensions will allow for further reflection and a better understanding of the different components of the knowledge base, their relative strength and weakness, and how they interact together.

One last point: this work is not normative and there is no prescription or expectation of the "best" knowledge base. Certain countries might choose to aim for a balanced knowledge base, wherein each of the three dimensions is given equal weight. Others might choose to reinforce a particular aspect of the knowledge base to reflect their national priorities. It is their responsibility to make this decision and design their teacher education systems accordingly.

The ITEL TKS assessment results

A note of caution: due to the small sample size of this pilot study, the results presented in the rest of this chapter are strictly preliminary and suggest the type of research and policy questions that the project could address more thoroughly with a larger sample.

In the ITEL TKS pilot, profiles were developed based on the proportion of participants in each category (teachers, teacher candidates, and teacher educators) who answered at least 60% or more of the questions in each dimension correctly. Throughout the rest of the chapter, the score attributed to a given dimension or sub-dimension refers to this proportion (Box 4.1).

Box 4.1. What do we mean by a score?

For the purposes of this pilot survey, the 'score' attributed to a given dimension/sub-dimension was defined as the proportion of respondents from each sample who responded correctly on at least 60% of the items per dimension.

Other approaches could have been chosen, such as standardised mean test scores; however, these would shift the focus to ranking country performances, whereas the approach used here is designed to further explore the nature of teachers' pedagogical knowledge base and the relative performance on different dimensions. Once validated and extended to a full representative sample, these profiles could then be useful for both research and policy purposes.

Due to the nature of this pilot study and the small samples; the interpretations ascribed to the various profiles should be used as a basis for further analytical exploration during the main study rather than as rigorous evidence in its own right. The following aspects are important to take into account when interpreting the results of the pilot:

All items were reviewed by experts from participating countries as well as two independent international experts, and ranked according to theoretical validity and cultural adaptation. Out of 100 items (see Table 1.2) 52 were top ranked and selected for empirical testing. Some items show differences in ease/ difficulty, indicating a need for further refinement of terminology or translation. Due to small sample sizes the items will be treated with equal weight in the profiles. A representative sample will take into account the psychometric properties of the items in the sum scores.

A missing value on any of the questions is treated as missing. Due to small samples no imputation is made.

Models were tested separately by the three dimensions, instructional, process, learning process, and assessment and not as a nested three factor model. The three sets of items were not developed towards sharing a defined difficulty on average; therefore each dimension in the pedagogical knowledge framework should be viewed with its own reference point.

The results of the pilot revealed three broad profiles based on the relative proportion of instructional process (INST), learning process (LEARN) and assessment (ASSESS). The profiles are set out below in the order of frequency:

- **Profile 1: Assessment**. A higher proportion of respondents scored at least 60% on questions classified as part of the Assessment dimension. This profile was the most common across samples, and has three further variations that are outlined later in this chapter.

- **Profile 2: Instructional**. The Assessment dimension was still strong, but a higher proportion of respondents scored at least 60% on questions in the instructional process dimension.

- **Profile 3: Balanced**. A similar proportion of respondents scored at least 60% on all three dimensions.

Interestingly, there was no case where a higher proportion of respondents scored 60% or more on the Learning dimension than on either of the other two dimensions. This is somewhat surprising, given that the classic theories of development and learning are covered in most teacher education programmes (see Chapter 3), so respondents were expected to score well on these items. A possible explanation for this might be due to the relative ease/difficulty of items in this dimension. As discussed in Chapter 2, the validation revealed that several items in the Learning dimension turned out to be particularly difficult, especially for the teacher sample (see Table 4.1). A possible explanation for this pattern could be that teacher candidates are more up to date with the core knowledge obtained in initial teacher education, such as classic theories, compared to teachers with several years of practice oriented work experience.

Table 4.1. Items characterised by ease/difficulty along the proficiency scale, by dimension

Teachers	Instructional	Learning process	Assessment
Difficult	2/18	5/14	3/17
Easy	0/18	1/14	6/17
Teacher candidates			
Difficult	2/18	2/13	4/16
Easy	1/18	0/13	2/16

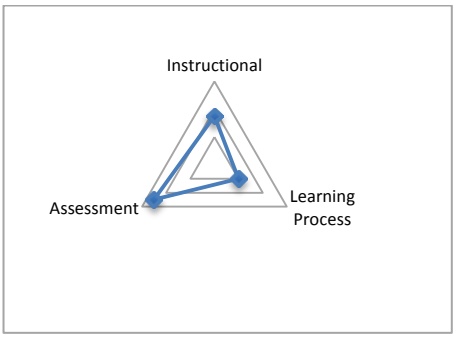
Note: "Difficult" items have a low probability of being answered correctly when placing them on a proficiency scale. "Easy" items have a high probability of being answered correctly even for those individuals who would fall on the lower end of the proficiency scale.

A further example is provided by the assessment dimension, which contained a higher number of items that were easy, especially for teachers. This means that teachers in particular tended to score well in this dimension, regardless of ability level. In contrast, the items in the Instruction dimension showed similar patterns of differentiation and few appeared too easy or difficult. When looking at the relative strengths or weaknesses in the profiles of participating countries, it is important to take into account that items performed differently across countries. This is to say that in some countries, an item could appear more difficult/easier on the difficulty distribution than in other. This in turn will affect how the profile in that country differs from another. The results from the validation (see Annex IV. for details) can help contextualise these differences. The profiles outlined below on broad and sub-dimensions of the assessment framework contain items in group 1 and 2, empirically tested in the validation. Box 4.2 has a more explorative approach of different thematic orientations of knowledge and contains all items in group 1, 2 and 3.

Profile 1.1:

This profile is prominent in Hungary and Israel and is also prevalent among teachers and teacher candidates. As seen in Figure 4.1, there is a clear skew towards the Assessment dimension, although the Instructional dimension is also relatively strong. The Learning dimension is weakest.

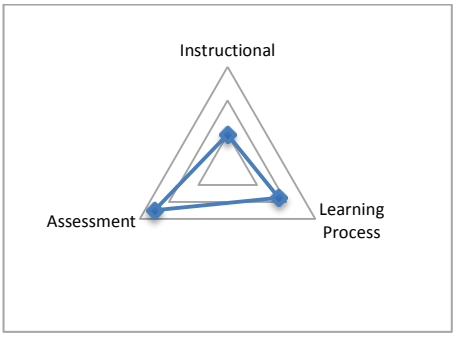
Figure 4.1. Profile 1.1. High assessment, modest instruction, low learning



Profile 1.2:

This profile is also skewed towards Assessment. However, Learning is second strongest, while Instructional is weakest. This model is typical in teachers in Greece and the Slovak Republic.

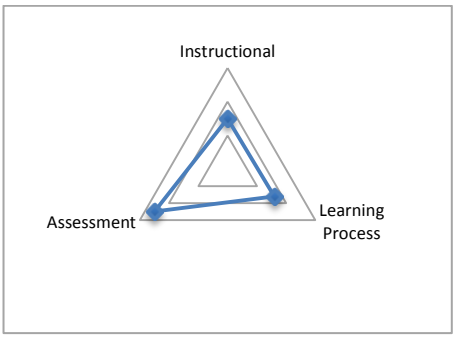
Figure 4.2. Profile 1.2. High assessment, modest learning, low instruction



Profile 1.3:

In this profile the Assessment items are strong while the Learning and Instructional dimensions are balanced. This profile is seen in teacher candidates in Greece and the Slovak Republic.

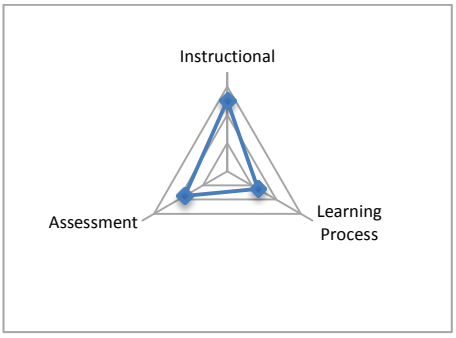
Figure 4.3. Profile 1.3. High assessment, balanced learning and instruction



Profile 2:

This profile is skewed towards Instructional process. Assessment is also strong, but Learning is weak. This profile is seen among teacher educators in Israel and teacher candidates in Estonia.

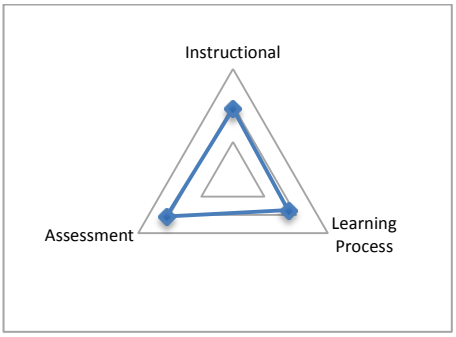
Figure 4.4. Profile 2. High Instruction



Profile 3:

The final profile is balanced, as exemplified by relatively similar proportions between the three dimensions, although the Assessment dimension typically still comes out strongest. It is only seen among teacher educators in the Slovak Republic and Estonia.

Figure 4.5. Profile 3. Balanced



Summary

When considering teachers, teacher candidates and teacher educators' general pedagogical knowledge, it might be expected that they would possess a strong and balanced knowledge base across the three domains of instruction, assessment and learning. However, the pilot revealed that there is in fact variation in the strengths and weaknesses of the participants, as reflected in the various profiles.

Teacher candidates and teachers are most closely aligned with Profile 1 (Assessment), while teacher educators are spread across all three categories: Profile 1 – Assessment (two countries) Profile 2 – Instructional (one country) and Profile 3 – Balanced (two countries). Table 4.2 provides an overview.

Table 4.2. Pedagogical knowledge profiles by country and sample

	Estonia	Greece	Hungary	Israel	Slovak Republic
Teachers	P1.1	P1.2	P1.1	P1.1	P1.2
Teacher Candidates	P2	P1.3	P1.1	P1.1	P1.3
Teacher Educators	P3	P1.3	P1.2	P2	P3*

As mentioned earlier in this chapter, the Assessment items tended to be easier than the other dimensions, and so the preponderance of Profile 1 (Assessment) should be interpreted with caution. However, there may also be other reasons for the strong dominance of Assessment in the profiles. For example, in everyday practice, and with increasing experience, teachers are likely to develop their Assessment knowledge and continually update this knowledge base. Assessment is also an important priority in most OECD countries and might therefore be more strongly reflected in teacher education programmes and professional development opportunities. Additional research is required to analyse these possibilities and verify the validity and independence of the assessment items and instrument.

The following section will elaborate on the data obtained from the five participating countries and its implications. However, as this is a pilot study, the analysis of the profiles should be used as a basis for further exploration in the main study, rather than as rigorous evidence in its own right.

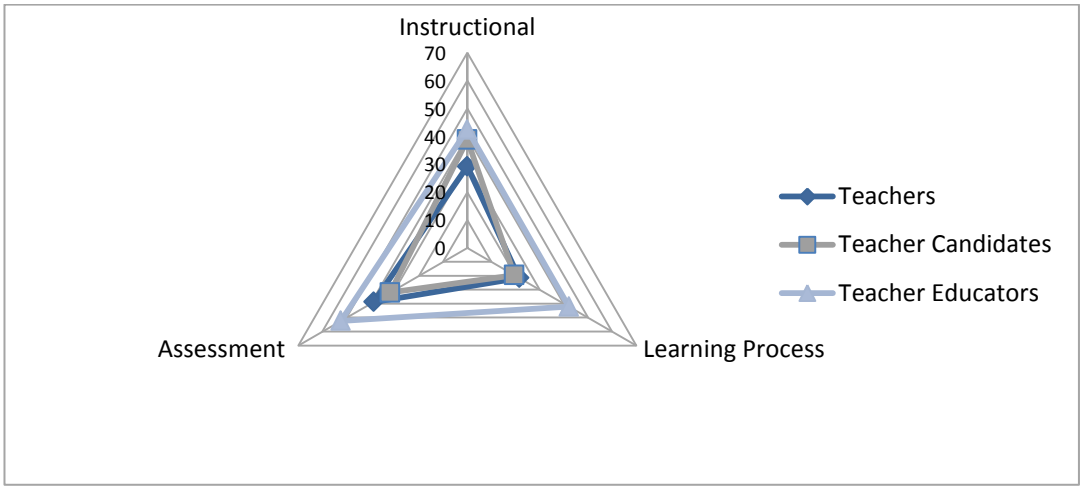
Estonia - Knowledge profiles

- Teachers in Estonia generally have an *Assessment knowledge base* (Profile 1), with 38.8% of respondents scoring 60% or more on Assessment items, followed by Instructional items (29.2%) and Learning items (21.6%).

- Teacher candidates in Estonia exhibit an *Instructional knowledge base* (Profile 2; 38.8%), followed by Assessment (31.9%) and Learning (19.5%).

- Teacher Educators exhibit a more *Balanced knowledge base* (Profile 3), characterised by fairly similar scores in all three dimensions. 52.3% of respondents scored 60% or more on the Assessment items, 42.5% on Instructional and 42.1% on Learning.

Figure 4.6. Profile of Teachers, Teacher candidates and Teacher Educators in Estonia



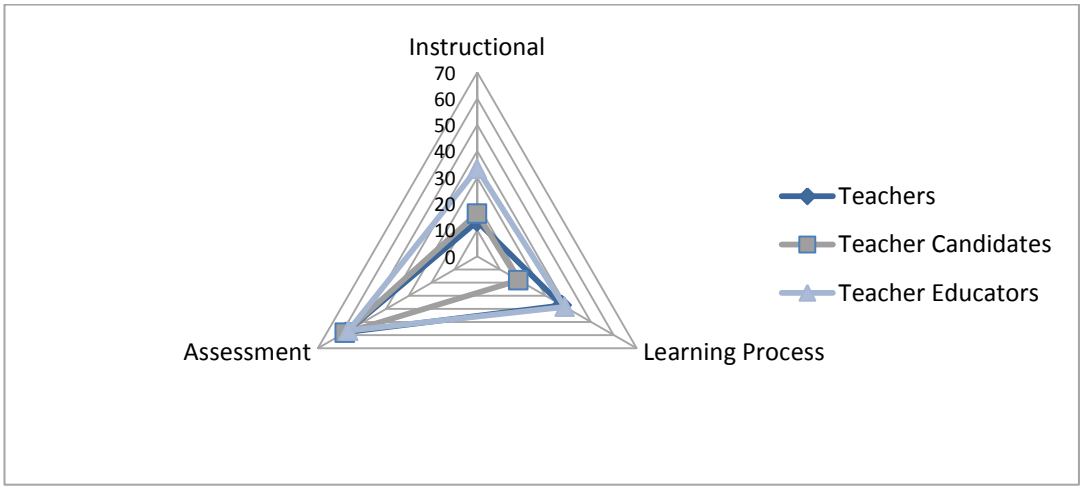
Greece - Knowledge profiles

All three groups in Greece scored highest in the Assessment items, followed by the Learning and Instructional items. However they break into two different sub-profiles:

- Teachers in Greece exhibit Profile 1.2, scoring 57.7% on Assessment items, 37.3% on Learning items and 13.2% on Instructional items.

- Teacher candidates and teacher educators in Greece exhibit Profile 1.3. Both favour Assessment items (58% of teacher candidates and 57% of teacher educators) and balance Learning and Instruction (18% and 16% respectively for teacher candidates versus 39% and 33% for teacher educators).

Figure 4.7. Teachers, Teacher candidates and Teacher Educators in Greece



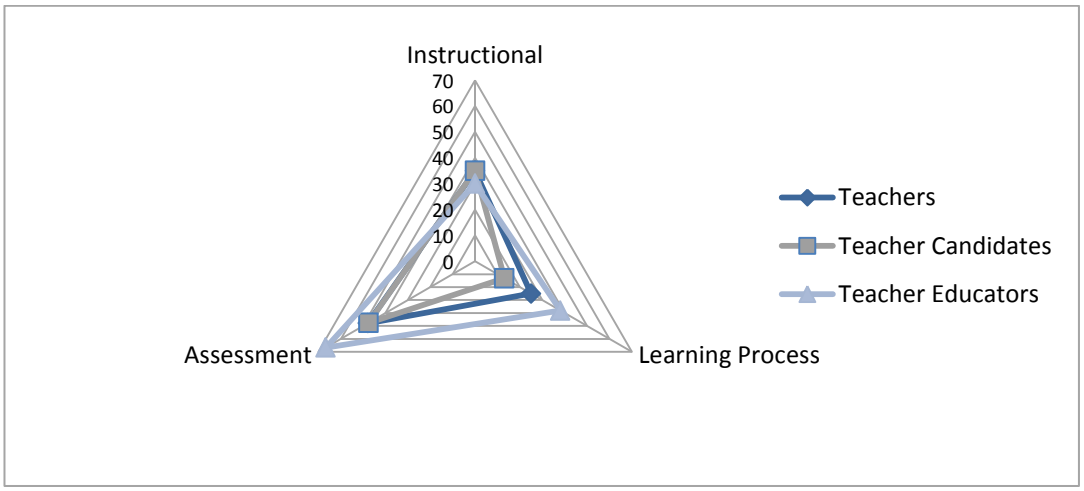
Hungary - Knowledge profiles

All three groups in Hungary scored highest in Assessment, although they exemplify two different sub-profiles:

- Teacher candidates and teachers' results aligned with Profile 1.1. Both groups scored 48% on Assessment items and 35% on Instructional items. Teacher candidates scored 13% in Learning, while teachers scored 25%. These results suggest that experience may play a large role in this dimension, particularly in the Motivational and Affective Dispositions sub-dimension where the teachers did particularly well.

- Teacher educators scored higher in the Learning dimension than in the Instructional dimension, exhibiting Profile 1.2. With the highest scores in Assessment items (67%), they also performed better on Learning items (38%) than on Instructional items (30%).

Figure 4.8. Profile of Teachers, Teacher candidates and Teacher Educators in Hungary

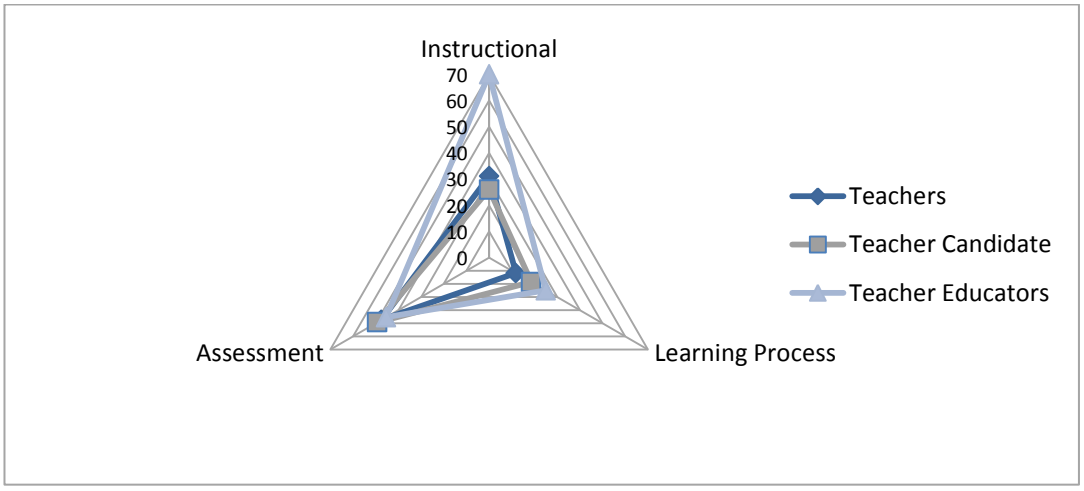


Israel - Knowledge profiles

- Teacher candidates and teachers both exhibit Profile 1.1, with almost 50% of respondents scoring 60% or more on the Assessment items. The difference between scores in Instructional and Learning is smaller for teacher candidates (31% and 21% respectively for teachers, versus 26% and 19% for teacher candidates).

- Teacher educators exemplify Profile 2, as they scored 70% on Instructional items, 45% on items in Assessment and 25% in Learning. The scores in Assessment are broadly similar for both teachers and teacher candidates, the main difference being that teacher educators scored very highly in the Instructional dimension.

Figure 4.9. Profile of Teachers, Teacher candidates and Teacher Educators in Israel



Slovak Republic

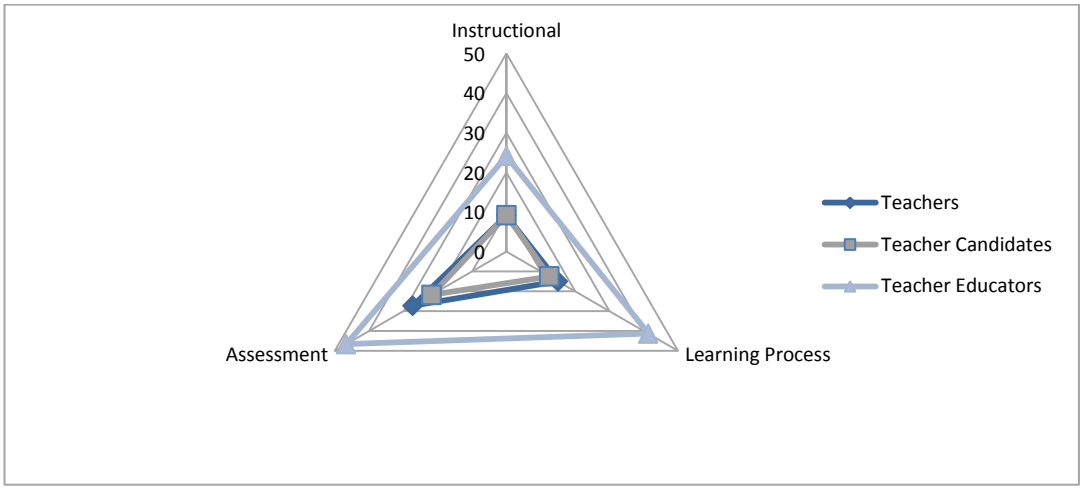
Knowledge profiles

- Teachers in the Slovak Republic exhibit Profile 1.2, having scored 27% on Assessment items, followed by 15% on Learning items and 9% in the Instructional dimension.

- Teacher candidates in the Slovak Republic exemplify Profile 1.3, having achieved 22% on Assessment items, 13% on Learning items and 9% on Instructional items.

- Teacher educators in the Slovak Republic have a generally balanced knowledge base (Profile 3), characterised by a fairly even proportion (47% and 41% respectively) of respondents scoring 60% or more on Assessment and Learning items (41%). However, instructional items were weaker (24%), thus undermining the balance of the profile.

Figure 4.10. Profile of Teachers, Teacher candidates and Teacher Educators in the Slovak Republic



Thematic analysis of sub-dimensions

As laid out at the beginning of the chapter, each of the dimensions was also broken down into two sub-dimensions. Due to the pilot nature of the study we do not present the results by country here, but rather give an overview by sample (teacher candidates, teachers and teacher educators combined across all countries) to give a sense of the potential of the instrument in terms of more specific thematic analysis of pedagogical knowledge.

Both *teacher candidates* and *teachers* exhibit the most strength in data use and research literacy. These items measured knowledge of statistical concepts, as well as knowledge of interpreting and applying research evidence. Strength in this sub-dimension can partly be related to the specificities of the teacher sample, namely that one quarter of respondents were mathematics teachers, and approximately one third science teachers, while only 19% mother tongue language teachers. As subject training of maths, and potentially sciences, includes statistics, this result might not be borne out in a larger sample with a more diverse set of teachers. Teacher candidates preparing to teach mathematics or sciences (21% and 23% respectively) also outnumbered those preparing to teach mother tongue language (23%), although the distribution was more balanced.

Teacher candidates' second strongest area is classroom management, which may seem surprising, as we would expect that practical experience matters more for a domain that pertains directly to the actions teachers take (Evertson and Weinstein, 2006). Classrooms are characterised by simultaneous and often unpredictable events, which teachers have to lead to enable learning (Voss, Kunter and Baumert, 2011). The ITEL TKS instrument assessed teachers' knowledge about classroom management through items relating to how to activate the class, teaching pace and classroom discipline, methods to maximise students' learning time, classroom rules, as well as the concepts of positive/negative punishment and reinforcement. Some 60% of these items were categorised as practice-based, versus only 20% theoretical/scientific knowledge[8], which is in line with the more practical nature of this domain (see Box 4.2 for knowledge profiles based on type of knowledge). Being unprepared to deal with classroom events, such as disruptive behaviour, is one of the major reasons for new teachers' "reality shock". Adequate training in classroom management is important to

[8] Not all items were assigned to one of these categories (see Chapter 1).

develop such skills and to increase teachers' wellbeing at the start of their career (Dicke et al., 2015a). A strong knowledge base in this area thus has a potential to decrease early attrition.

Teachers' second strongest knowledge domain is evaluation and diagnosis procedures, which, in the ITEL instrument pertained to knowledge of the forms and quality of assessment, assessing collaborative skills, transfer of learning and learning gain, and giving feedback. This sub-dimension measured practise-based knowledge slightly more strongly (50% of items vs 38% of theoretical/scientific), and core knowledge more dominantly than recent concepts relating to 21st century teaching (58% and 8% of items respectively) (see Box 4.2). Strength in this area can reflect increasing importance of accountability measures in education systems.

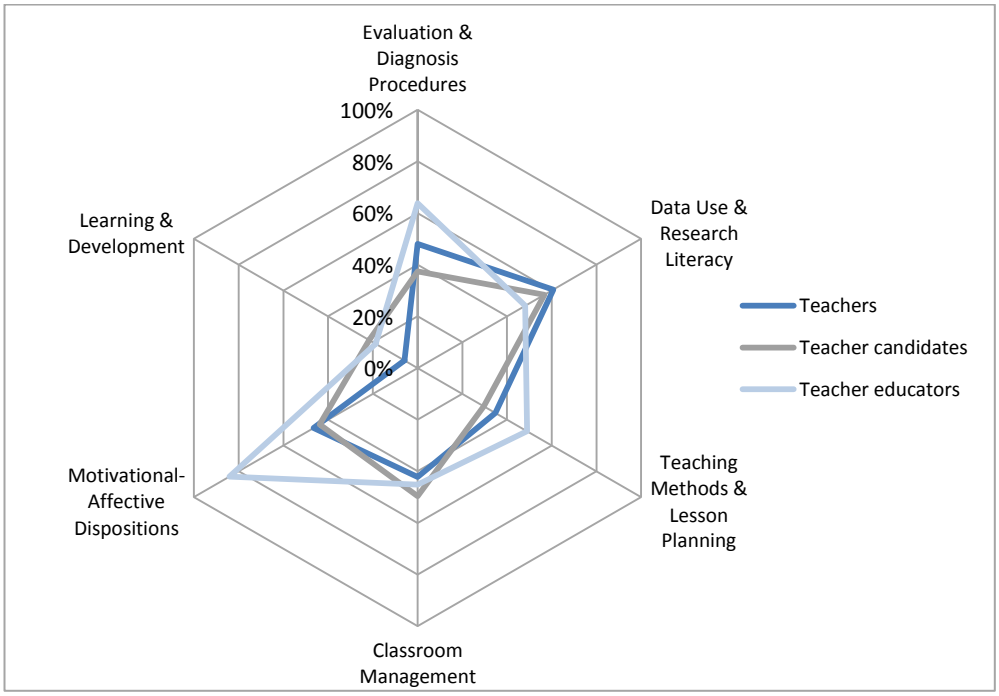
Teacher educators' profile is strongly skewed towards motivational-affective dispositions, testifying knowledge pertaining to types of student motivation, goal orientations, mastery and performance. The percentage of high-performing teacher educators in this domain stands out among all samples and all sub-dimensions, and is significantly higher than teacher candidates' and teachers' knowledge in this domain. This may suggest that teacher educators' knowledge of motivational-affective dispositions is, for some reason, more formalised, i.e. they understand better the role of motivational-affective factors for teaching, and have accordingly built a relevant knowledge base.

Surprisingly, data use and research literacy is also a relatively weak area of teacher educators' knowledge base. Only 19% of teacher educators reported that they teach methods of educational research in initial teacher education. At the same time, more than half of this sample reported that research activities are important in their performance evaluation. Since items in this area focused more strongly on quantitative research skills, it may be that the majority of the teacher educators sampled in this pilot engage in qualitative research rather than quantitative.

Summary

The weakest area is learning and development. Items in this domain covered topics such as the functioning of the brain and memory, learning styles and learning taxonomies, critical thinking and metacognition. More than half of the items (57%) measured theoretical/scientific, and none practice-based knowledge, while their thematic orientation was somewhat more balanced with 43% of items referring to key demands for 21st century teaching and 29% core knowledge. Teacher candidates showed stronger knowledge on key demands than on core theories of learning and development (see also Box 4.2). The importance of theories about how children learn and develop is emphasised in many teacher standards (Toledo-Figueroa, Révai and Guerriero, 2017). For example, being aware of the existence of general constraints on learning may help teachers better understand learners in their classroom, their behaviours and individual differences (Ansari et al, 2017). While such knowledge may seem more theoretical and less directly relevant for practice, the lack of strong knowledge related to learning and development can in fact result in insufficient expertise to handle heterogeneous classrooms and make appropriate decisions regarding teaching approaches.

Figure 4.11. Profile of teacher candidates, teachers and teacher educators per sub-dimension



Although these results are preliminary, they are a potential insight into the development of the knowledge base throughout a career. If these data were to be reproduced with a representative sample, it might suggest that initial teacher education puts more emphasis on classroom management, while professional development focuses more on student evaluation on average. Interestingly, TALIS data revealed that a larger proportion of teachers participated in professional development related to student evaluation and assessment practices than classroom management, although they also report a strong need for professional development related to classroom management (OECD, 2014b).

In addition, comparing teacher candidates' and teacher educators' knowledge base could shed light on knowledge transfer mechanisms in initial teacher education. As might be expected, teacher educators' knowledge clearly surpasses that of teacher candidates in a number of domains: motivational and affective disposition, evaluation and diagnosis procedures and lesson planning and teaching methods. However, it is interesting to note that teacher candidates' exhibit a slightly more extended knowledge base than teacher educators on classroom management and data use, and research literacy. These differences might reveal the importance of alternative learning mechanisms such as learning from school-based mentor teachers (see Chapter 5).

These arguments illustrate the analytical potential of the ITEL TKS instrument, which could be extended in a number of different ways with a representative sample. This analysis only briefly reports on these issues, given the particularly small sample size of teacher educators.

Box 4.2. Is teacher knowledge relevant to 21st century teaching?

The ITEL TKS instrument included three supplementary measures of knowledge (see Chapter 1) that pertain to the following questions:

1. To what extent do teachers have theoretical-scientific knowledge and to what extent are they able to apply this in the classroom context to make professional judgements?

2. To what extent can teachers recall facts, and understand and analyse information?

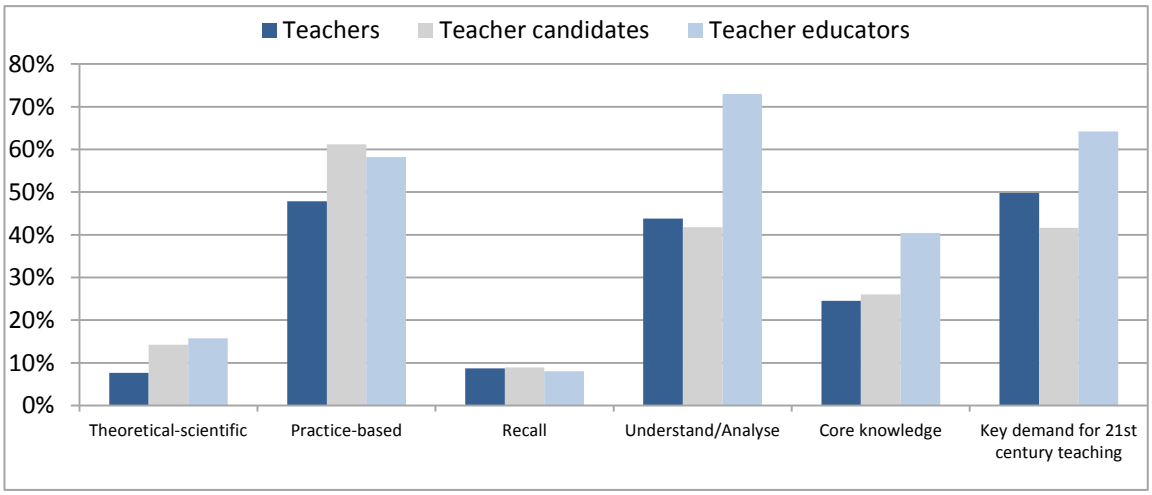
3. To what extent does the pedagogical knowledge of the teaching profession incorporates the latest scientific research on learning?

The first two questions are not entirely independent, as all items that measure the ability of recalling facts also measure theoretical-scientific knowledge. The fact that all three samples exhibit a strongly practice-based knowledge and able to understand and analyse situations better than recall facts (Figure 4.12), suggest that in both initial teacher education and professional development the focus is on applying theories in teaching practice. The distribution of theoretical-scientific and practice-based items was not even in the three knowledge dimensions, for example, the Learning Process dimension did not contain any practice-based items. This finding is thus in line with the knowledge profiles described in this chapter.

The third question addresses a major research and policy concern, i.e. whether the teacher knowledge base is regularly updated with recent findings from the learning sciences and other relevant disciplines (Dumont, Istance and Benavides, 2010). ITEL TKS data suggests that a larger emphasis is placed on recent findings than on more traditional theories, as all three samples performed better on key demands for 21st century teaching than on core knowledge. However, this may partly be due to the uneven distribution of practice-based and theoretical-scientific items in these dimensions: while these were evenly distributed in the key demand dimension, there were twice as many theoretical-scientific items in the core knowledge dimension.

While analysis of the above supplementary measures can reveal important characteristics of teacher education, the framework would require further development to be able to independently analyse these measures.

Figure 4.12. Knowledge profiles based on type of knowledge, thematic orientation and cognitive demand (percentage of respondents scoring more than 60% of the items in the given dimension)



Conclusions and recommendations for a large-scale study

1) Improve the frameworks for measuring pedagogical knowledge

Improving the frameworks will enhance the quality of measurement of the dimensions of pedagogical knowledge. To illustrate, there has been some debate about the conceptual validity of the two sub-dimensions of Assessment: Evaluation and Diagnostic Procedures, and Data Use and Research Literacy. Some believe the latter constitutes its own dimension, or is more relevant to the Learning dimension, while others question how accurately the two sub-dimensions capture the Assessment processes of teachers. Consequently, it would be useful to undertake further empirical validation of the dimensions and their categorical breakdowns.

The framework can also be improved in regards to the distribution of each of the measures (for example, practice-based versus theoretical-scientific knowledge), which should be more even across the knowledge dimensions. It is important that the strengths and weaknesses of a profile are not due to the overrepresentation of items measuring a particular type of knowledge, or a particular cognitive demand.

2) Identify common characteristics of shared profiles among different countries

Further analysis with more representative samples and a broader range of participants will shed light on the common characteristics among the teaching systems of different countries. For example, having larger data samples to categorise into the various profiles will make it easier to identify shared factors between countries, and hence add to our understanding of the trends of teachers' knowledge. This information will be useful for policymakers aiming to reform teaching pedagogy, even if the instrument does not provide sufficient evidence of causality.

3) Explore the relationship between general pedagogical knowledge (GPK) and pedagogical content knowledge (PCK)

GPK, i.e. pedagogical knowledge applicable across subjects, has been the focus of the ITEL TKS pilot, as it is less studied than PCK (pedagogical knowledge tied to a specific subject). In the future, the instrument might benefit from measuring both sets of items so as to explore their interrelationship (e.g. whether GPK is more applicable to certain subject areas, and if so, in what ways can PCK enhance GPK). Incorporating items of PCK would also facilitate synergies between ITEL and other large-scale studies focused on specific subject areas.

4) Identify the profiles of low achievers

The current profile analysis presents the proportion of teachers, teacher candidates and teacher educators with a score of 60% or above on the items in each dimension and sub-dimension. A different type of analysis (i.e. quartile) could identify the profiles of low achievers as well as teachers with different levels of knowledge. For example, the profiles could change substantially if the mean score were reported, or if the proportion of teachers who scored 75% or above was measured instead.

6) School-level analysis

A main study could be designed to accommodate school-level analysis, as a representative sample of schools may more clearly convey relationships between teachers' knowledge profiles and school characteristics. In such a case, it would be necessary to collect information about the schools.

CHAPTER 5: TEACHERS' OPPORTUNITIES TO LEARN

Introduction

This chapter explores how and what teacher candidates and teachers learn in initial teacher education and professional development. The study addresses the following research questions:

- To what extent are teacher education programmes providing teachers with opportunities to learn the knowledge and skills for effectively teaching students for the 21st century society?
- What is the relationship between general pedagogical knowledge and learning opportunities in teacher education?

Answering these questions can help inform teacher education policies by revealing whether its content is relevant, what is missing, in what ways its quality could improve and, in general, where countries could invest more in order to ensure that teachers have an updated and robust knowledge base. In line with the main focus of the study, this chapter looks at opportunities to learn general pedagogy (i.e. knowledge of teaching and learning that is cross-curricular; for more on this, see Chapter 1) both in terms of content and various dimensions of quality.

This chapter discusses the two research questions above in the context of the background, rationale and constructs, and data collected in the ITEL Teacher Knowledge Survey (TKS). Box 5.4 presents an additional research question on the knowledge dynamics in the teaching profession. The chapter concludes with recommendations for the design of a large-scale study.

Opportunities to learn: The content and quality of teacher learning in initial teacher education and professional development

High-quality learning opportunities are a fundamental condition for improving teachers' competence, including their subject-specific and pedagogical knowledge (Blömeke, 2017; Schmidt, Cogan and Houang, 2011; Schmidt et al., 2008; Schmidt et al., 2007). The body of research on opportunities to learn as a measure of the quality of teachers' knowledge is growing. Variations in opportunities to learn during teacher preparation appear to be related to differences in student achievement, as assessed by international studies such as PISA and TIMSS (Schmidt, Cogan and Houang, 2011; Schmidt et al., 2008; Schmidt et al., 2007). Early results also suggest relationships between motivation and making use of opportunities to learn in initial teacher education, although these are still underexplored (König, 2017).

The pilot ITEL TKS looks at various aspects of opportunities to learn, including its scope and quality (described in Chapter 1). It focuses on opportunities to learn in initial teacher education for teacher candidates and in both initial education and professional development for teachers. Such learning opportunities include not only content taught in teacher education and professional development programmes, but also access to experiential opportunities that allow putting knowledge into practice, opportunities to actively participate in the process of research and inquiry, and learning from high-quality role models such as teacher educators and in-school mentors. While teacher learning

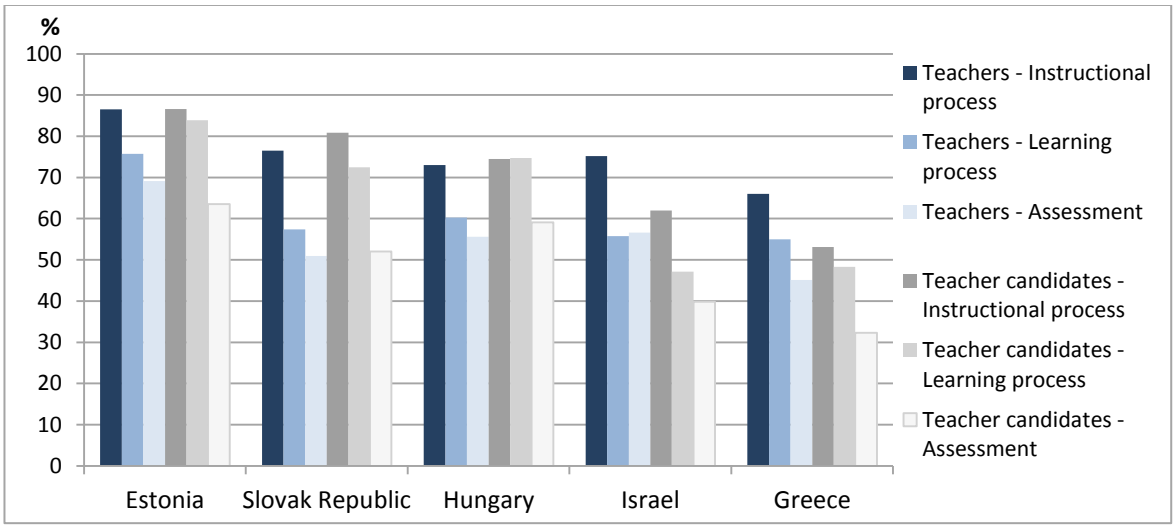
includes formal, non-formal and informal settings[9], the ITEL TKS mainly focuses on formal and non-formal learning through initial teacher education and professional development.

What do teachers and teacher candidates learn about?

The survey asks teacher candidates and teachers whether they have learnt about certain specific topics and areas. Although the survey also covers practical training via questions about what teacher candidates' teaching practicum involves, this area is beyond the scope of the current chapter.

The pedagogical content items of the opportunities to learn instrument are broad in scope, with a focus on 45 specific elements. These have been categorised into the same three dimensions as the pedagogical knowledge items – instructional process, learning process, assessment (see Chapter 1) – to demonstrate how the pedagogical knowledge assessment framework makes connections between knowledge and opportunities to learn. The categorisation of the opportunities to learn items (see Table II.5.1. in Annex II.) was theoretically validated by two independent experts. Figure 5.1 shows the proportion of pedagogical content from the three dimensions that teachers and teacher candidates reportedly had the opportunity to learn.

Figure 5.1. Opportunities to learn pedagogical content in the three main dimensions



[9] *Formal learning* refers to organised settings with clear learning objectives, usually leading to a certificate. For teachers, this would typically be initial education that takes place at a higher education institution.

Non-formal learning is also somewhat organised and can have learning objectives. It may or may not lead to formal certificates. In the case of teachers, organised professional development such as thematic courses, workshops or conferences are examples of non-formal settings.

Informal learning is not organised and has no set objective in terms of learning outcomes. Often it is referred to as learning by experience. It could include collaboration between teachers at school (although this can be non-formal in the case of an organised workshop series, for example), work-based learning, or learning that happens through interactions with other teachers, parents, students or others (http://www.oecd.org/edu/skills-beyond-school/recognitionofnon-formalandinformallearning-home.htm)

Data clearly suggests that content related to the instructional process, including teaching methods, planning and structuring pedagogical units, and classroom management, is dominant both in initial teacher education and in professional development. In all participating countries except Greece, teachers and teacher candidates report having learnt on average more than 70% of topics in this area. Assessment and research literacy, on the other hand, appears to play a less important role: in four out of five countries (the exception being Estonia), both teachers and teacher candidates report having studied on average less than 60% of the topics related to this area. The three least extensively studied topics all belong to the assessment dimension: "career guidance for students", "guiding parents in how they can reinforce classroom learning to help their children learn", and "grade retention (e.g. practices, advantages, disadvantages)". Only around a third of teachers and less than one fourth of teacher candidates reported having learnt about these issues.

Interpreting cross-country variations necessitates a better understanding of the contextual opportunities to learn in national teacher education systems. To illustrate, institutional interviews reveal that some teachers and teacher candidates in Greece have few opportunities to gain knowledge about teaching and learning, as the acquisition of pedagogical competences has only recently become a prerequisite for secondary teachers in Greece (see Chapter 3).

In contrast, Estonian teacher candidates reported having extensive opportunities to learn general pedagogy. For example, while knowledge of disciplinary content has traditionally been the focus in teacher education, one of the two institutions interviewed described a shift in recent years to strengthen pedagogical knowledge, with the new curriculum now including courses on teaching and reflection, designing learning and instruction, teacher's identity and leadership, and communication and feedback in school. The relatively extensive learning opportunities of Estonian teachers may also be due to high participation in professional development (OECD, 2014b).

Another factor to consider when interpreting reported opportunities to learn is the stage and structure of teacher candidates' studies. The majority of participating teacher candidates in Estonia and Greece were not in their final year of training (nor were they teachers in their first year of service; see Table 5.1). For Greek teacher candidates this could mean that they had not yet had their semester of pedagogical training (ITEL TKS institutional data, see Chapter 3) and have yet to learn pedagogical content. On the other hand, Estonian teacher candidates would have already had pedagogical training by the completion of their first year of master's studies (the survey was administered towards the end of the academic year).

Table 5.1. Stage of study of teacher candidates

	In final year of initial teacher education	In first year of teaching	Other	Total number of respondents
International	33.8%	5.63%	60.56%	426
Estonia	18.35%	4.59%	77.06%	218
Slovak Republic	77.55%	3.06%	17.76%	98
Hungary	44.19%	13.95%	41.86%	43
Israel	m.d.	m.d.	m.d.	m.d.
Greece	13.43%	7.46%	79.10%	67

m.d: missing data

Teaching diverse classrooms

In addition to the three main dimensions of the assessment framework, the ITEL TKS instrument explores several other specific domains of pedagogical knowledge, including "teaching diverse classrooms". Teachers today work with increasingly heterogeneous groups of students, and hence, adapting teaching methods to the differences of children has become a key competence requirement (Toledo, Révai and Guerriero, 2017; OECD, 2010). This is reflected in results of the Teaching and Learning International Survey (TALIS), where teachers report a relatively high need for professional development on teaching diverse classrooms[10], in particular with regards to teaching students with special needs (OECD, 2014b). The ITEL TKS asks respondents whether they have learnt about a number of topics specifically related to this broad competence domain (see Box 5.1).

In general, teachers' opportunities to learn about these areas in initial education or professional development vary (see Figure 5.2). Individual differences and differentiated instruction stand out as strong elements of teacher education in most countries, particularly Israel and Hungary, and the former is also prominent in Estonia, where more than 70% of teachers had the opportunity to study the topic (see Figure 5.3). In comparison, fewer than half of teachers reported having learnt about other relevant areas, such as intercultural pedagogy, inclusive pedagogies, identification of giftedness and of learning difficulties, integration of pupils with special needs, and gender pedagogy. The pattern for teacher candidates is similar across participating countries – learning about students' individual differences is reported to be the most represented element of teaching diverse classrooms, although there is large variation. Fewer teacher candidates (less than half of the pooled sample) reported having opportunities to learn about differentiated instruction; however, more reported having studied the integration of pupils with special needs and intercultural pedagogies.

Box 5.1. Opportunities to learn about teaching diverse classrooms in the ITEL TKS instrument

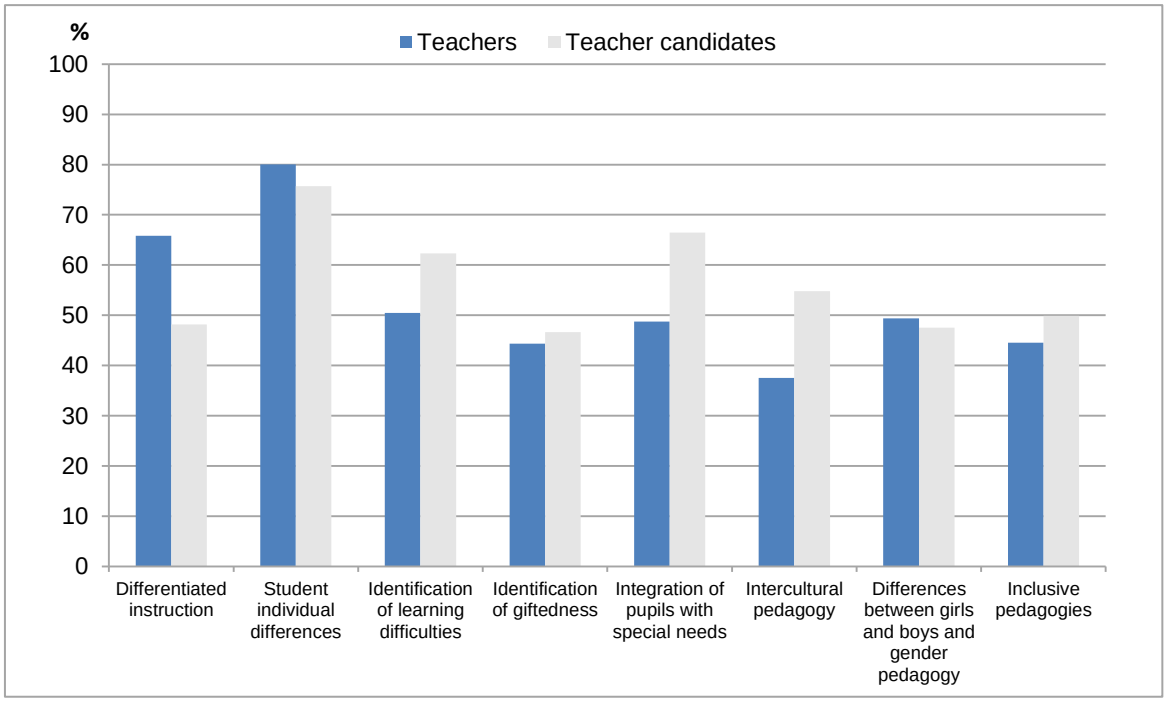
The ITEL TKS theoretical framework did not define the domain of "teaching diverse classrooms" explicitly; the instrument included a number of items related to working with heterogeneous classrooms. The survey asked respondents whether they have learnt about:

- differentiated instruction (e.g. individual assistance, internal differentiation, personalised instruction)
- student individual differences (e.g. prior knowledge, motivation, ability levels)
- identification of learning difficulties of students and interpretation of specialists' diagnosis (e.g. dyslexia, dysgraphia, attentional problems, etc.)
- identification of giftedness
- integration of pupils with special needs
- intercultural pedagogy and pupils with different nationalities, cultures and social background
- differences between girls and boys and gender pedagogy
- methods and interventions for inclusion and inclusive pedagogies, i.e. methods for preventing and dealing with discrimination and bullying based on gender, sexual orientation, cultural background, etc.

Note: See Table II.5.1. in Annex II. for the full list of items.

[10] The TALIS index of "needs for teaching for diversity" considers professional development needs for: (i) approaches to individualised learning; (ii) teaching students with special needs; (iii) teaching in a multicultural or multilingual setting; (iv) teaching cross-curricular skills; (v) approaches to developing cross-occupational competencies for future work or future studies; and (vi) student career guidance and counselling.

Figure 5.2. Percentage of respondents reporting having learnt about various aspects of teaching diverse classrooms (international pooled data)



In the following, the results from three areas of teaching diverse classrooms are discussed from the perspective of making education more equitable.

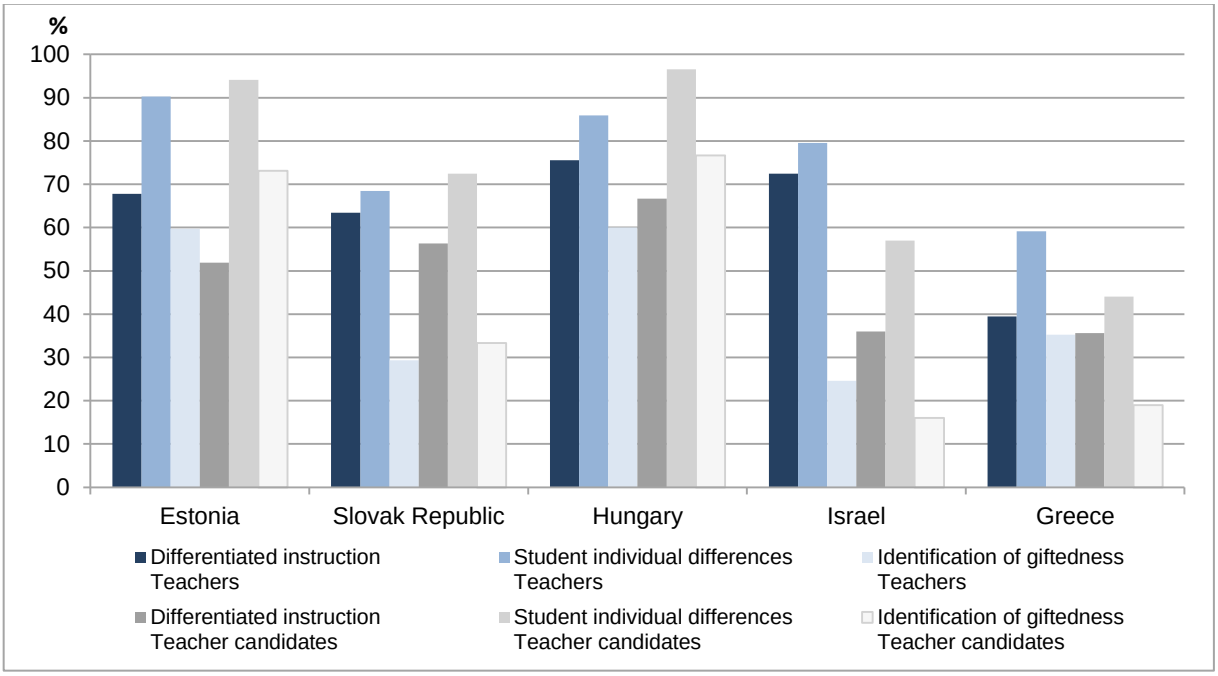
Intercultural pedagogy: A consistently low proportion of teachers (less than half of the ITEL TKS sample) reported learning about intercultural pedagogy (i.e. enhancing sensitivity about different cultures, and learning to live, work and interact with people from different cultures). This is perhaps not surprising, given the demographics of the participating countries. As measured by PISA 2015, the proportion of first generation immigrant students in Estonia, Hungary and the Slovak Republic is considerably lower than the OECD average, and closer to but still below the averages in Greece and Israel. The share of non-immigrant students who speak a language at home that is different from the language of instruction is also small compared to other PISA countries, except in the Slovak Republic (OECD, 2016c). Regardless, it is still important for teachers to develop competencies such as strong awareness and high sensitivity of cultural differences in order to best serve all of their students.

Gifted children: The results from this category should also be interpreted with respect for each country's individual context. For example, in Hungary, the development of gifted children is an important element in educational discourse (Nahalka, 2014), so it is not surprising that more teachers learn how to identify giftedness. It is however important to note that such areas can potentially refer to different discourses and content, which in turn, can lead to diverse pedagogical strategies.

This is an interesting result from a number of angles, particularly in terms of the alignment between educational research and policy-making. The field of gifted education is characterised by diverse approaches and concepts. Dai and Chen (2013) identified three paradigms: the gifted child paradigm, in which giftedness refers to general intelligence, as measured by intelligence tests; the talent development paradigm, which adopts a developmental perspective (e.g. Renzulli, 2005), and the differentiation paradigm, which has a diagnostic focus on individual needs, and therefore often criticises the idea of a broad "gifted-child pedagogy" (e.g. Kaplan, 2003; Nahalka and Mózessy,

2011). Each paradigm implies different pedagogical approaches ranging from pull-out and self-contained programmes to mentorship or differentiated instruction. In general, the giftedness research is conceptually diverse and backed by controversial evidence (Ziegler and Raul, 2010); hence, it is not clear whether learning about the "identification of giftedness" actually leads to knowledge and skills that produce a more equitable education.

Figure 5.3. Percentage of respondents reporting having learnt about three selected aspects of teaching diverse classrooms



Inclusive pedagogies: Another underrepresented area in teacher education is inclusive pedagogies, which covers methods for preventing and dealing with discrimination and bullying based on gender, sexual orientation and cultural background. A large proportion of both teachers and teacher candidates report that they have not been taught about this area, although there are variations across countries (with the least extensive opportunities to learn being in Israel and the most in Estonia for both groups). While achieving inclusion and equity in education systems is a complex challenge that can only be solved through appropriate educational structures and cultures, ensuring that teachers possess sufficient knowledge of inclusive pedagogies is a critical step.

Among participating countries, a student's socioeconomic background determines his or her performance to the least extent in Estonia, according to 2015 PISA data. Moreover, Estonia has the largest share of teachers (64.4% on average) who report having learnt about issues of diversity, in contrast with other participating countries, where this proportion is lower than 50%. In particular, equitable education is still a significant challenge in Hungary and the Slovak Republic, but less so in Israel (OECD, 2016c). On the whole, the data suggests that many aspects of diversity pedagogy are not yet integral parts of teacher education. Future investigations should include a detailed analysis of initial teacher training and professional development syllabi to reveal more insights to the specific content related to this area. Furthermore, adding items measuring knowledge of teaching diverse classrooms in the assessment instrument is essential for understanding whether teachers are sufficiently prepared to face this major 21st century challenge.

21st century teaching

Helping students develop "21st century" skills, such as creativity, innovation, critical thinking, and problem solving has become a basic requirement for teachers. Hence, teachers must regularly integrate emerging evidence on how to create learning environments that support the development of these competencies into their knowledge base (Pellegrino, 2017). These modern pedagogical approaches and the extent to which teachers have opportunities to learn about them are measured through ITEL TKS data (see Box 5.2).

Box 5.2. Opportunities to learn 21st century teaching in the ITEL TKS instrument

One of the drivers for the ITEL TKS was to find out whether the teaching profession has updated knowledge for teaching in the 21st century society. The instrument asked respondents if they have learnt about some of the more modern pedagogical approaches that reflect the demands of 21st century teaching and learning, including:

- project work and other types of student assignments that require more than one week to complete or for students to work in groups
- gamification (e.g., application of game-design elements and game principles in teaching)
- use of ICT in class (e.g., internet and software tools for pedagogical purposes)
- use of media and various resources for teaching (e.g., videos, visuals, or objects and materials from everyday life)
- various forms of interactive activities for involving and engaging students in classroom discussions
- different teacher roles (e.g., information provider, facilitator, mediator, planner)
- types of performance appraisal other than school grades (e.g., formative and summative evaluation, written or oral feedback, student portfolio, etc.).

In Figure 5.4, learning opportunities of 21st century teaching are compared to more traditional theories of learning and education. The data suggests that whereas the vast majority (over 70%) of teacher candidates and teachers in all countries learnt psychological and educational theories, there is larger variation when it comes to studying modern pedagogies. While over 80% of teachers in participating countries learn about using ICT in the classroom (except in Hungary, where it is 70%), as well as using media and other resources (also above 80%, except in Greece and the Slovak Republic), gamification shows a more mixed picture. In Estonia and the Slovak Republic, over 80% of teacher candidates and teachers reported that gamification was part of their initial training and/or professional development; however, this proportion is much lower (between 30% and 50%) in the other countries (see more on gamification in Box 5.3).

Figure 5.4. Percentage of respondents reporting having learnt about 21st century pedagogies versus educational and learning theories

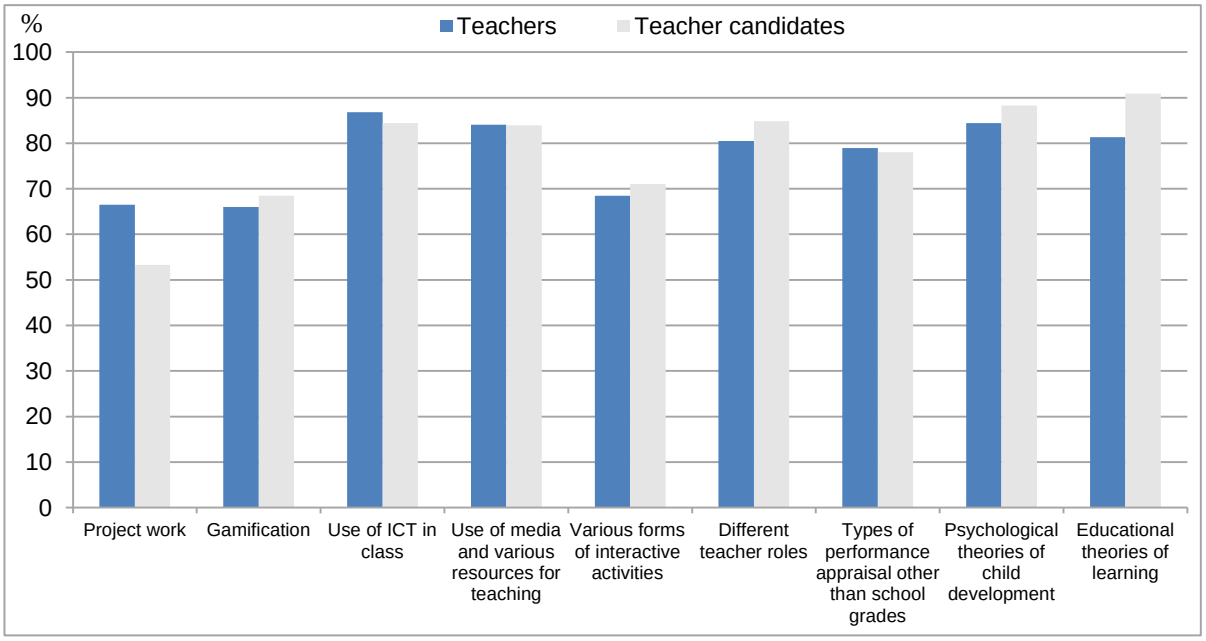


Figure 5.5 also reveals differences between the two samples across participating countries. For example, teachers reported having had more opportunities to learn about modern pedagogies (e.g. project work, gamification, ICT and media use) than did teacher candidates in Greece. This might suggest that some of the more modern pedagogical content is covered in professional development programmes rather than in initial teacher education. This might go some way towards explaining the strong interest Greek teacher's show in professional development (further discussed in Chapter 6). On the other hand, teacher candidates in Hungary reported having had more opportunities to study these topics than did teachers, potentially indicating that changes have been made to the content of initial teacher education.

Box 5.3. Gamification as an innovative pedagogy

1. What is gamification?

The 'magic' of playing games lies in their potential to teach players complex rules by introducing them to unfamiliar worlds and engaging them in tasks and logic in which they have little or no prior skill. Tulloch (2014) argues that video games are 'sophisticated pedagogical systems' that represent another step in the long history of play in pedagogy. Gamification refers to "using game design elements in non-game contexts" (Deterding et al., 2011) and examining ways in which the pedagogical structure of games can be used in the design of educational activities while maintaining a sense of playfulness.

2. How is it useful for student learning?

Playing can improve memory and stimulate growth in the cerebral cortex, provide venues through which learners can engage with academic tasks, contribute to language development, and promote creative problem solving and reasoning, among other benefits (Dewar 2014). Through gaming, children can achieve a state of "flow", i.e., a state of total focus without feeling too bored/relaxed or anxious/thrilled (Csíkszentmihályi, 1990).

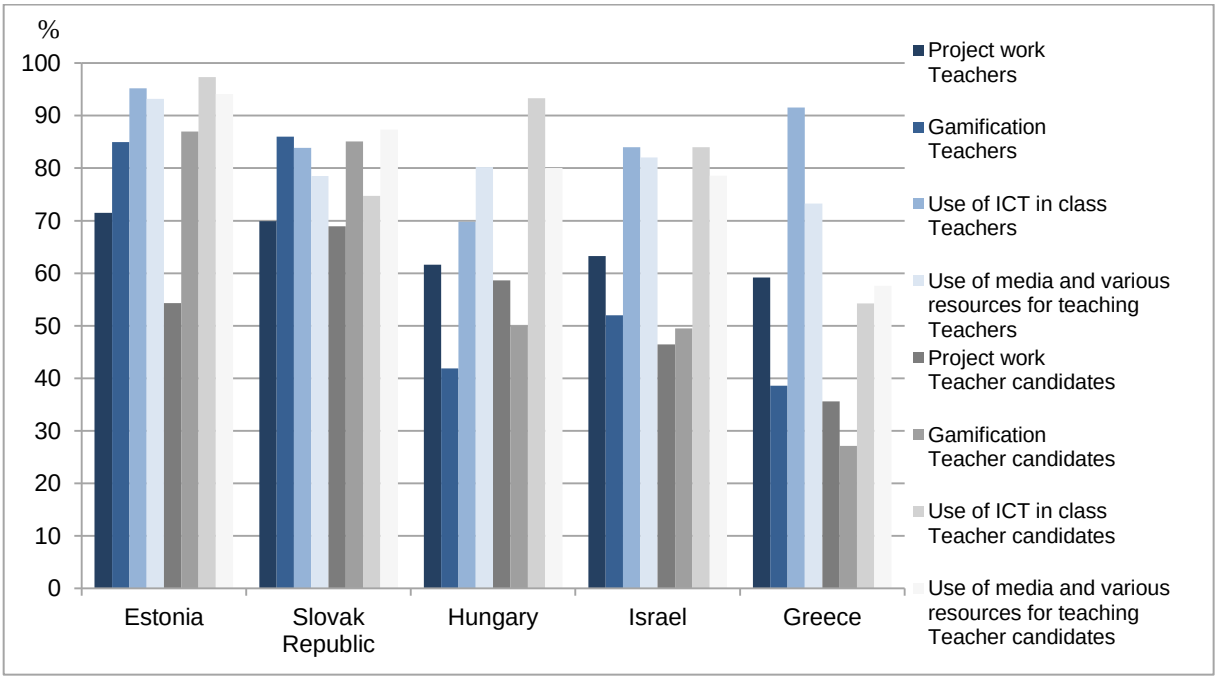
The idea of gamification also highlights the importance of the learner's voice and agency and therefore implies rethinking and adding nuance to the Vygotskian notion of 'zone of proximal development'. Through the lens of play and gaming, the learner's ability informs the design of learning activities, and the activity itself also activates the motivation and enjoyment that encourage students to go beyond the requirements to meet extended goals (Abdul Jabbar and Felicia, 2015).

3. What knowledge and skills do teachers need to enhance student learning through gamification?

Teachers need to feel comfortable with games and playing in order to effectively incorporate gamification into their pedagogical structure either explicitly (e.g. by using a particular game) or implicitly (e.g. by making students feel as if they are playing during a particular activity). Gamification can be broken down into two main pedagogical components necessary to teachers: mechanical elements relating to the design of games (points, progressive challenges such as levels, interaction and constant feedback), and emotional elements (narratives that immerse players in the universe of the game, fictional identities and a sense of collaboration/competition). These features can be understood as particular methods and concepts that teachers should learn, starting from making them conscious of how these elements are combined in any game. In addition, another important way to learn how to implement gamification is enabling teachers to use already known methods and practices from formal pedagogies (e.g. narrative pedagogies or experiential learning) that are closely connected with the pedagogical structure of games.

Source: OECD (forthcoming), *Innovative Pedagogies for Powerful Learning*.

Figure 5.5. Percentage of respondents reporting having learnt about certain 21st century pedagogies



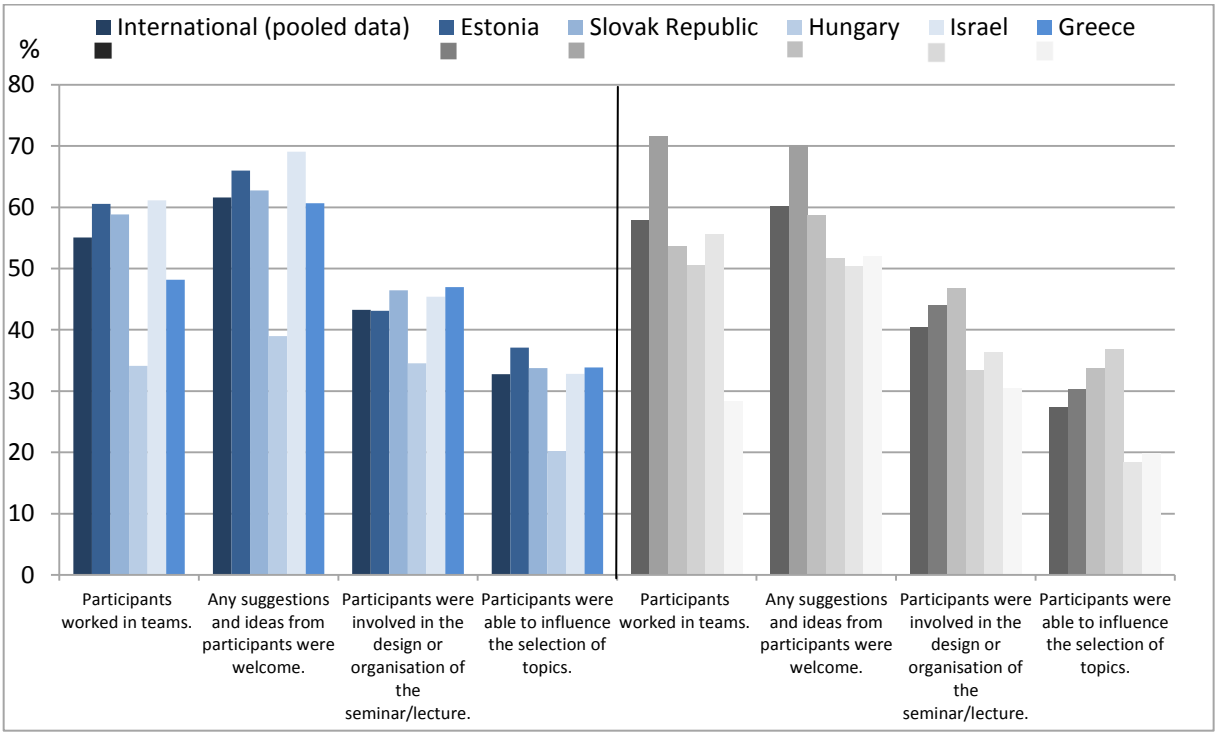
How do teachers and teacher candidates learn?

Teacher education research has looked into what quality characteristics make programmes, and more generally, professional learning (including professional development) more efficient. Evidence suggests that opportunities for active learning are positively related to changing practices and improving student learning (Caena, 2011; Cordingley, 2008; Timperely et al., 2007; Garet et al., 2001). Studies of continuous professional development (CPD) have also demonstrated that collaborative programmes have more of an impact than do non-collaborative ones (Cordingley et al., 2005). In addition, as Cordingley and colleagues' (2005) study found, one key characteristic of collaborative CPDs is the scope it provides for participants to identify their own professional development focus.

The ITEL TKS explores the quality of courses offered in initial and continuing training, as well as the teaching practicum for teacher candidates. In accordance with the items of the EMW-study (see König et al., 2014), the quality of opportunities to learn consists of three scales: (1) *the quality of instruction*, which measures the extent to which pedagogical knowledge was presented and structured clearly and in a challenging, motivating and interesting way; (2) *the extent of demands*, that is, how demanding it is to complete the course(s) and; (3) *student agency*, which describes the extent to which participants – in this case teacher candidates in initial teacher education and teachers in professional development – are involved in planning and organising learning content.

Figure 5.6 depicts the perception teacher candidates and teachers have of the quality of their opportunities to learn. Data from the ITEL TKS indicates that while students' suggestions and ideas are more commonly accepted in initial training and professional development (except in Hungary, where this index is particularly low among teachers), direct student involvement in the design and organisation of courses is low across countries and samples.

Figure 5.6. Quality of opportunities to learn in initial teacher education and professional development



Note: Weighted averages of percentage of respondents answering on a scale of 1 (does not apply at all) to 4 (fully applies).

Other influences on the quality of professional development include peer support and feedback, collaborative forms of learning (e.g. being involved in communities of practice, learning in teams), and engagement with learning (e.g. through professional dialogue, discussions and negotiation of new content) (Caena, 2011; Cordingley, 2008; Timperely et al., 2007). Teamwork and active contribution to plenary discussions are important facets as well, and hence were measured in the ITEL TKS. Both were found to be prevalent in teacher education and professional development across all participating countries, except Hungary, where they were less commonly used. Notably, teacher candidates in Greece reported working less in teams and participating less in active discussions during their initial education; the latter was also rare in the Slovak Republic. In contrast, teachers and teacher candidates in Estonia report high levels of both team work and active discussion in their initial training and professional development.

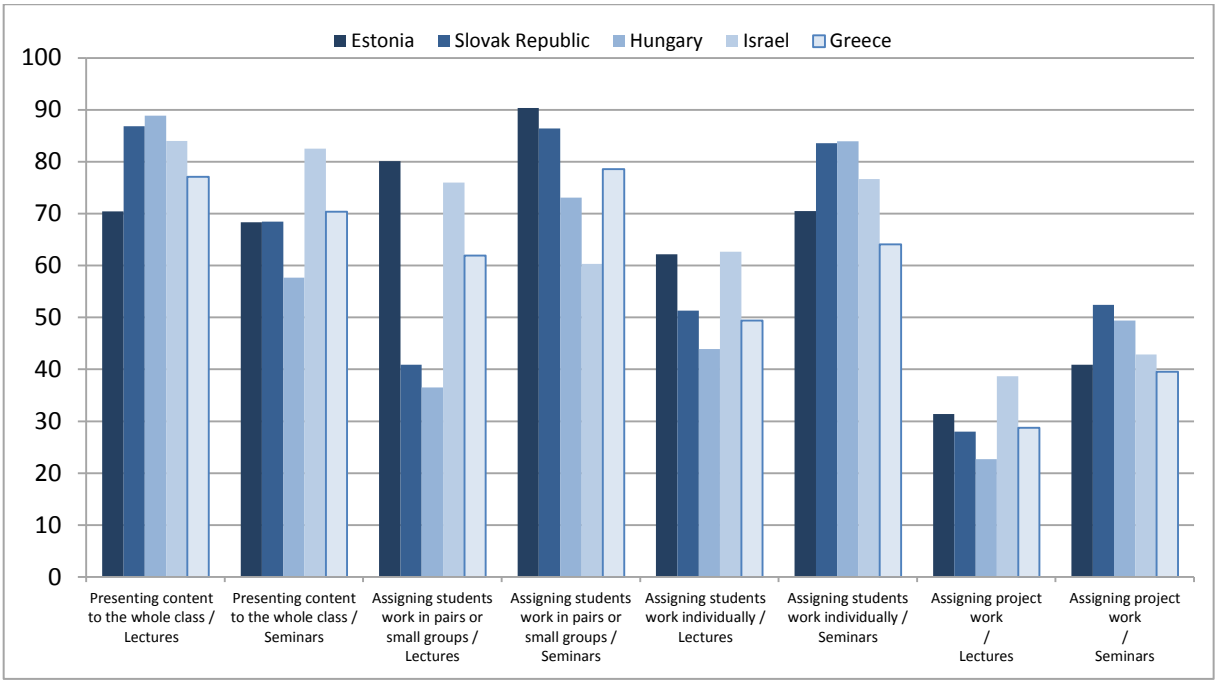
While ITEL TKS data did not show consistent correlation patterns, our hypothesis that certain characteristics of teacher education programmes influence teachers' interest in professional development was substantiated in some of the participating countries. To illustrate, in Israel, teachers who report working in teams in professional development courses are also more likely to report being interested in participating in professional development. In Greece and Estonia, agency over the content and design of professional development is positively associated with interest in participation (see Annex I. Table I.5.11). These initial findings emphasise the importance of the quality of teacher education in motivating teachers to regularly update their knowledge.

The quality of teacher learning is also influenced by the pedagogical practices of teacher educators that also constitute a role model of teaching for teacher candidates (European Commission, 2013; Lunenberg, Korthagen and Swennen, 2007; Loughran and Berry, 2005). In line with this, the ITEL TKS also looks at the methods teacher educators report using in their lectures and seminars. As

shown in Figure 5.7, while presenting content to the whole class is dominant in lectures, making students work in pairs and small groups or individually is not uncommon either (although less so in Hungary and the Slovak Republic).

Among participating countries, group projects are atypical in lectures, with less than 4% of teacher educators reporting utilising this form of student engagement regularly, and less than a quarter indicating that they use it "sometimes". On the other hand, teacher educators appear to engage students more actively during seminars, and individual, pair and group work are commonly reported in most countries. Project work is also more frequently assigned; however, it remains an uncommon mode of assignment, with less than half of teacher educators reporting using this form "sometimes" or "often".

Figure 5.7. Opportunities to learn: Methods used by teacher educators at lectures and seminars



Note: Weighted averages of percentage of respondents answering on a scale of 1 (never) to 4 (often, at least weekly).

To return to our first research question, the pilot survey results suggest that teacher candidates and teachers' opportunities to learn do not fully cover all of the topics necessary for preparing students for 21st century society. Specifically, teacher education programmes could better equip the teaching workforce to work with heterogeneous student groups and make use of modern pedagogies adapted for 21st century learning. Moreover, the quality of learning opportunities can be improved by ensuring greater agency for participants and interactive and collaborative forms of learning. Lastly, the ITEL TKS produced a number of findings regarding the dynamics of knowledge (see Box 5.4); however, these will require further exploration with representative samples in order to draw relevant and robust conclusions with the potential to improve teacher education policies.

Box 5.4. Knowledge dynamics in the teaching profession

Individual teachers' knowledge and the knowledge base of the teaching profession as a whole transforms through learning and experience (Guerriero and Révai, 2017). Ideally teacher learning should contribute to building an individual and collective knowledge base that regularly integrates the most recent results of educational and learning sciences. However, education is often accused of lacking efficient mechanisms linking research and practice, as research does not consistently constitute the scientific basis of teachers' everyday pedagogical judgements (e.g. Hargreaves, 1996; OECD, 2007; Dumont, Istance and Benavides, 2010; Levin, 2011; Goldacre, 2013).

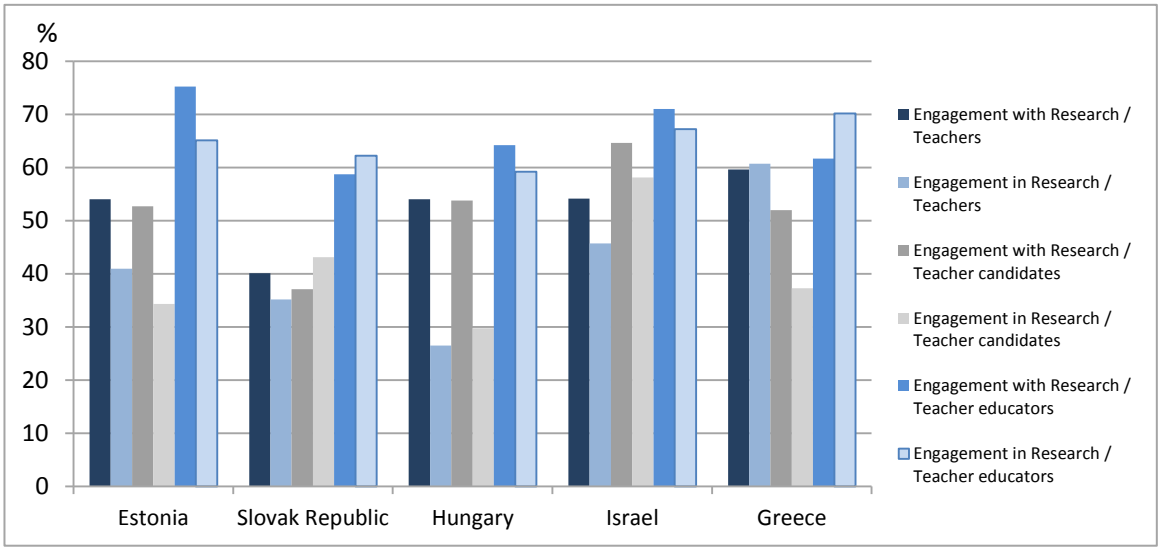
The ITEL TKS investigated this issue through two questions:

1. To what extent and in what ways do teacher candidates, teachers and teacher educators engage in and with research to improve their practice?

2. How does the professional network relate to stay abreast of the latest in pedagogical knowledge?

Teachers, teacher candidates and teacher educators consistently reported engaging more *with* research than *in* the process (see Annex II. for scales and questions). This difference was most marked for teacher candidates and teachers. Only slightly over half of teachers across participating countries reported engaging with research in some way. In Hungary, Estonia and Greece, this was generally done by reading research papers in the domain of the educational or learning sciences. Approximately two thirds of teachers in Greece and Israel (69% and 61% respectively) put research into practice through interpreting findings in terms of their teaching. In contrast, only 30% of teachers in Hungary did so (see Table I.5.8 in Annex I.).

Figure 5.8. Engagement with and in research



Note: Average percentage of respondents reporting being engaged with/in the activities defined in the scale.

In terms of professional network, teachers' collaboration within professional networks is positively (although not strongly) associated with their engagement in and with research (see Table I.5.10 in Annex I). For teacher candidates, significant correlations exist for engagement with research. On the whole, the ITEL TKS pilot data suggest that teaching practice is not yet strongly research-based in participating countries. Further development of the knowledge instrument could allow for an investigation of how well-prepared teachers are to use research to improve their practice, as well as the components of learning opportunities that predict this competence.

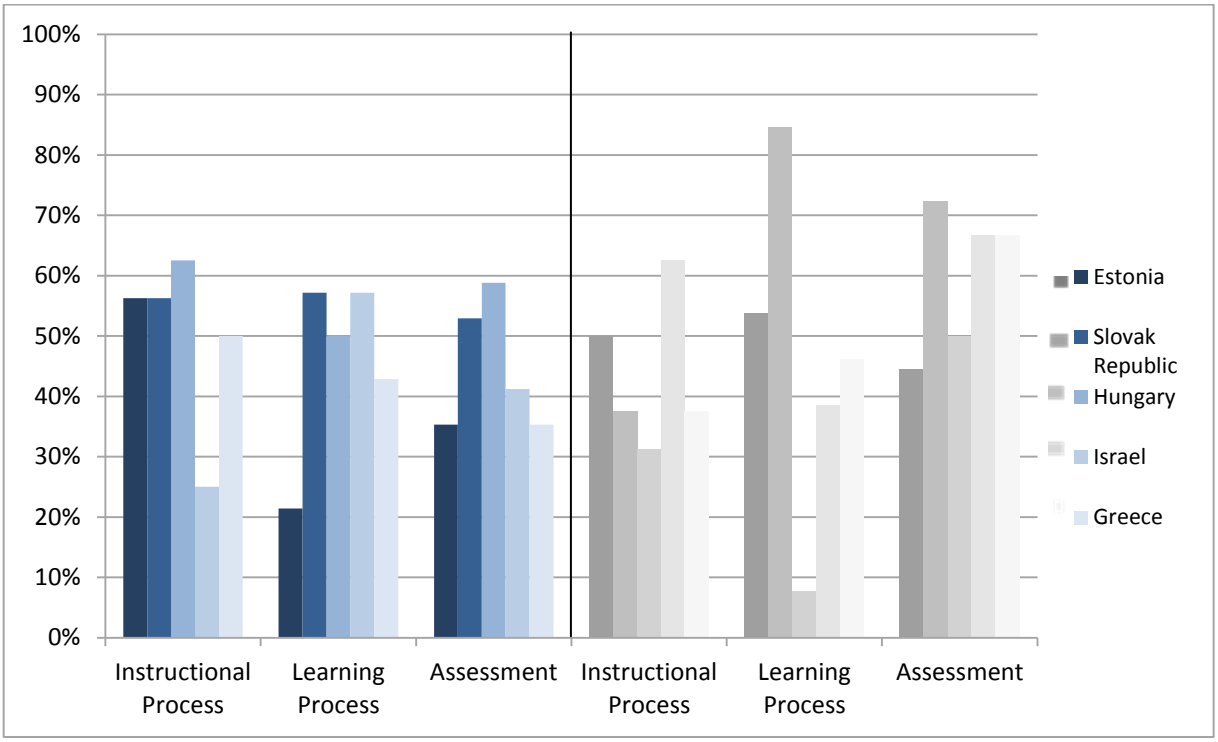
Relationship between pedagogical knowledge and opportunities to learn

The second research question relates to the relationship between knowledge and opportunities to learn. Evidence indicating that the latter can predict teachers' pedagogical knowledge is scarce. The TEDS-M study, for example, does not report on relationships between opportunities to learn and knowledge as measured by the instrument. More recent findings suggest that relationships exist, but report mostly weak and inconsistent correlations (König et al., 2017a; 2017b).

The ITEL TKS tested this, hypothesising that (for example) a teacher candidate had had the opportunity to learn about motivation, he or she would be more likely to correctly answer an item on that topic. However, no relationship was found between opportunities to learn and the corresponding knowledge dimension, further contributing to the inconsistent research results laid out above. The following section provides a more in-depth examination of this apparent disconnect between knowledge and the opportunities to learn.

As no relationship was found between the main dimensions, a more specific matching process was carried out between the two instruments. Pedagogical knowledge items were paired with at least one 'opportunities to learn' item on a theoretical basis (i.e. the specific contents of the knowledge items were matched with corresponding topics from the opportunities to learn instrument) to enable the calculation of logistic regressions. As Figure 5.9 shows, the relationship varied across samples, countries and knowledge dimensions.

Figure 5.9. Percentage of pedagogical knowledge items that show a relationship with corresponding opportunities to learn



Annex I. Table I.5.9.
Note: This figure shows the percentage of pedagogical knowledge items that can be predicted by the corresponding opportunities to learn items with an odds ratio larger than 1 per country for each main dimension.

Samples: In Estonia, Israel, Greece and the Slovak Republic, opportunities to learn and corresponding knowledge were more closely related for teacher candidates than for teachers. This could be because the content of initial teacher education is more salient and/or memorable for teacher candidates due to their more recent exposure.

Countries: Teachers' opportunities to learn are related to their knowledge most in Hungary and in the Slovak Republic. For teacher candidates, Israel and the Slovak Republic show the strongest link. It remains to be tested whether such variations would exist on large samples as well and how they can be explained. An in-depth analysis of the content of initial teacher education in the countries in view of the specific knowledge items might help understand variation for the teacher candidate sample. For teachers, the interpretation of these results is even more demanding due to the wide range of their learning opportunities.

Knowledge dimensions: The link between learning opportunities and knowledge is strongest in the case of instructional processes for both teachers and teacher candidates. This is followed by learning processes and then assessment for teachers, while the opposite is true for teacher candidates.

As mentioned above, the lack of a clear relationship between opportunities to learn and knowledge is not unique to the ITEL survey. It is therefore important to reflect on the factors that explain this phenomenon. Concerning the ITEL TKS data, these include technical issues related to the survey instrument and sampling method, and theoretical aspects concerning the nature of teacher learning. They are laid out briefly below.

Technical explanations

The lack of relationship may be due to discrepancies between the opportunities to learn and pedagogical knowledge items, i.e. the actual content taught in teacher education and the specific knowledge required to answer the ITEL pedagogical knowledge assessment instrument. For example, teacher candidates or teachers might report having learnt about "forms of working in the classroom (e.g. assigning and managing individual, pair, group and whole class work)", but may not be able to correctly answer a pedagogical knowledge item asking when it is suitable to use the lecture format. This could also explain why few predictive relationships between opportunities to learn and general pedagogical knowledge were detected in analyses of the sample data.

The weak relationship can also be due to small sample sizes and attrition. In particular, the response rate was much lower on the pedagogical knowledge part of the instrument than on the opportunities to learn component, possibly because of survey fatigue (the knowledge assessment was the last part of the survey). These issues could be assessed in a main study with larger sample sizes and alternating the order in which the survey sections are presented.

Theoretical explanations

A potential theoretical explanation is that some of the pedagogical knowledge is acquired through informal learning as opposed to formal or non-formal programmes and courses. For example, incongruities between the knowledge profiles (where the assessment dimension is dominant) and opportunities to learn (where assessment is weakest) could suggest that knowledge about this particular domain is at least partially acquired through informal learning. Analyses using the ITEL TKS professional collaboration index and years of experience as proxies for informal learning did not yield substantial results. Hence, more sophisticated measures of informal learning may be needed to reveal its effects on teachers' knowledge.

Weak links between theory and practice in teacher education can also cause discrepancies. Teachers and candidates may acquire theoretical/scientific knowledge about educational concepts, yet not be able to translate it into classroom practice. However, in order to ascertain the validity of this argument, the knowledge assessment instrument must measure not only theoretical/scientific, but also practice-based knowledge (i.e. the ability to apply a professional judgement deriving both from theoretical knowledge and contextually-specific experiences to answer classroom or situationally-phrased context-specific items). Although the ITEL instrument attempted to account for differences between these types of knowledge (see Chapter 1), the nature of the items still largely favour the theoretical/scientific.

Another theoretical argument relates to early career teachers. Research suggests that a teacher's first confrontation with classroom reality is often accompanied by the collapse of ideals or expectations developed during teacher education (Dicke et al., 2015a). Such "praxis shock" challenges the knowledge acquired in initial teacher education, which is further undermined by exposure to other knowledge systems promoted by more experienced colleagues. Research has found little evidence that school-based mentoring helps beginner teachers to make effective use of their theoretical studies (Hobson et al., 2009). Studies also suggest that some mentors may promote outdated views of teaching and learning (e.g. a transmission perspective) (Hobson et al., 2009). It is therefore possible that knowledge learnt in initial teacher education is overwritten to a certain extent through classroom practice and socialisation into the teaching community, resulting in an eventual gap between learning opportunities and the transformed knowledge of the practicing teacher. Such mechanisms may explain why the relationship between knowledge and opportunities to learn is stronger for teacher candidates in certain countries and certain knowledge dimensions.

In light of the above, the second research question regarding the relationship between general pedagogical knowledge and learning opportunities cannot be answered entirely satisfactorily with the ITEL TKS pilot data. Although some links can be established for certain countries and dimensions of opportunities to learn and knowledge, more significant results would require larger samples, as well as changes to the instrument design.

Conclusions and recommendations for the further development of the instrument

Based on analyses of the pilot data, the general recommendation for a future large-scale study is to keep a focus on the content and quality of opportunities to learn and further developing the instrument.

1. *Keep a focus on opportunities to learn*

Data on teachers and teacher candidates' opportunities to learn has the potential to reveal both strengths and gaps in teacher education. Comprehensive analysis of opportunities to learn can contribute to an understanding of learning and knowledge transfer in general, while also shedding light on the share of teachers who report having learnt about certain topics. When compared to competence requirements described in documents detailing (institutional, national, regional, or international) professional standards, competence frameworks, or expected teacher education learning outcomes, gaps and weaknesses become apparent. As well, when compared to teachers' perceived needs for professional development (e.g. using TALIS data), this type of analysis can provide insight into the relevance of teacher education content with regards to practitioner needs. Lastly, such data allows for the assessment of teachers and teacher candidates' learning opportunities in light of the challenges they face in the 21st century.

2. Improve relevance and coherence

The pedagogical content questionnaire would benefit from further development in two main ways. First, in terms of relevance, it could be enhanced by a deeper analysis of how requirements for teachers (e.g. formulated in professional standards, teacher education syllabi, research and policy documents) translate into pedagogical knowledge. Such analysis would facilitate the identification of relevant knowledge areas and thus improve the instrument's design. Second, the pedagogical content questionnaire can be better aligned with the knowledge items to establish a stronger link between learning opportunities and knowledge. Following these developments, the main dimensions of the study would need to be revised using rigorous evidence to ensure the theoretical validity of the scales.

3. Keep a focus on field experience

Field experience can play a key role in strengthening the link between theory and practice, and in fostering teachers' experiential knowledge. Hence, investigating the scope and content of teaching practicum can contribute to valuable recommendations on how to improve teacher candidates' learning. Improving this component of the survey would involve making a clearer distinction between teaching practicum and induction, and focusing more specifically on how teaching practicum helps establish the link between research and practice.

4. Keep a focus on the quality of learning opportunities

Relevant content is only one aspect of teacher education; in fact, the way it is presented and dealt with matters just as much for effective professional learning. The quality of learning opportunities can influence to what extent teachers and teacher candidates perceive their education to be clear, well-structured and intellectually challenging. Insights into the nature of teacher education, such as the extent to which it is collaborative or provides opportunities for agency, can lead to recommendations on how to improve quality.

CHAPTER 6: DRIVERS OF TEACHERS' PROFESSIONAL COMPETENCE

Introduction

Developing professional competence in teachers and maintaining high standards within education systems has been at the forefront of national policy considerations for some time (e.g. OECD, 2009). Empirical studies on teacher quality have shown that, in addition to profession-specific knowledge, beliefs, work-related motivation and professional self-regulation are related to successful teaching.

Competence can be operationalised as "skills, knowledge, attitudes, and motivational aspects that form the basis for mastery of specific situations" (Kunter et al., 2013). Although various concepts to motivation exist, a general definition is "the process whereby goal-directed activity is instigated and sustained" (Schunk, Pintrich and Meece, 2008, p. 4). This implies that motivation is inferred from actions (e.g. verbal statements, choices, effort or persistence) rather than products, i.e., outcomes. In the context of teaching, motivation is oriented towards teaching-related activities and tasks that have outcomes teachers either strive for or attempt to avoid.

This chapter will explore different motivational constructs, examining the associations between motivation and instructional quality. The teacher motivation dimension of the ITEL Teacher Knowledge Survey was implemented with the following research questions in mind:

- What are teachers' (and teacher candidates') motivational characteristics like?
- How do motivational characteristics relate to pedagogical knowledge, opportunities to learn (OTL) pedagogy and instructional quality?
- How do pedagogical knowledge and opportunities to learn pedagogy relate to the intent to persist in the profession?

Motivation is examined as a factor that is valuable beyond knowledge, as the ITEL TKS uncovered only small and insignificant relationships between the two. This finding is consistent with other work in the field. For example, Kunter et al. (2013) discovered positive associations between enthusiasm for teaching and instructional practices, and student achievement and motivation, despite non-significant correlations between enthusiasm and pedagogical content knowledge in maths. Other research has revealed a weak positive correlation between general pedagogical knowledge and teaching-specific efficacy (Lauermann and König, 2016), and that these two factors are significantly related to indicators of teacher wellbeing, such as emotional exhaustion (Dicke et al., 2015b). Such research thus provides evidence that both are important elements of teacher competence and not redundant.

In the ITEL TKS, teacher motivation was conceptualised based on socio-cognitive theory (self-efficacy), expectancy-value theory (motivations for teaching), and achievement goal theory (social goals for teaching), as well as recent work on teachers' intrinsic orientations towards teaching (enthusiasm for teaching), self-responsibility and commitment (motivations to persist in the profession, interest in professional development, and willingness to invest personal time) (see Table

1.4 in Chapter 1). These constructs are founded upon established theories of motivation that are applicable across different national and educational contexts (see Lauermann, 2015).

Teacher self-efficacy

Self-efficacy, which refers to confidence in one's ability to master specific tasks (Bandura, 1997), is related to teachers' motivation and performance (Lauermann, 2015; Tschannen-Moran and Woolfolk Hoy, 2001). Individuals tend to seek tasks for which they deem themselves sufficiently competent, and avoid those that exceed their perceived capabilities (Lauermann, 2015). Teacher self-efficacy has emerged as one of the foremost constructs in the study of teacher motivation (see Henson, 2002; Tschannen-Moran, Woolfolk Hoy and Hoy, 1998), and has gained attention in international policy fora due to its inclusion in large-scale international assessments such as TALIS (OECD, 2014b).

Teacher self-efficacy has been linked to higher levels of student motivation and achievement (Midgley, Feldlaufer and Eccles, 1989; Moore and Esselman, 1992; Tschannen-Moran and Barr, 2004; Caprara et al. 2006), and teacher commitment and job satisfaction (Tschannen-Moran and Woolfolk Hoy, 2001; Caprara et al., 2003). In addition, research suggests that lower levels of teacher self-efficacy can be predictive of burnout (e.g. Skaalvik and Skaalvik, 2007; Brouwers and Tomic, 1999; Schwarzer and Hallum, 2008), thereby potentially negatively impacting rates of teacher retention. While it is important for teachers to feel efficacious in their teaching-related skills and abilities, both extremely high and low self-efficacy can be problematic. For example, teachers at the highest and lowest ends of the self-efficacy spectrum are less likely to participate in professional development and learning than are those who report average self-efficacy (Grove, Dixon and Pop, 2009; Jurow, 2009; Kuskovski, 2008; Zambo and Zambo, 2008).

The ITEL TKS self-efficacy construct has four scales with two types of questions:

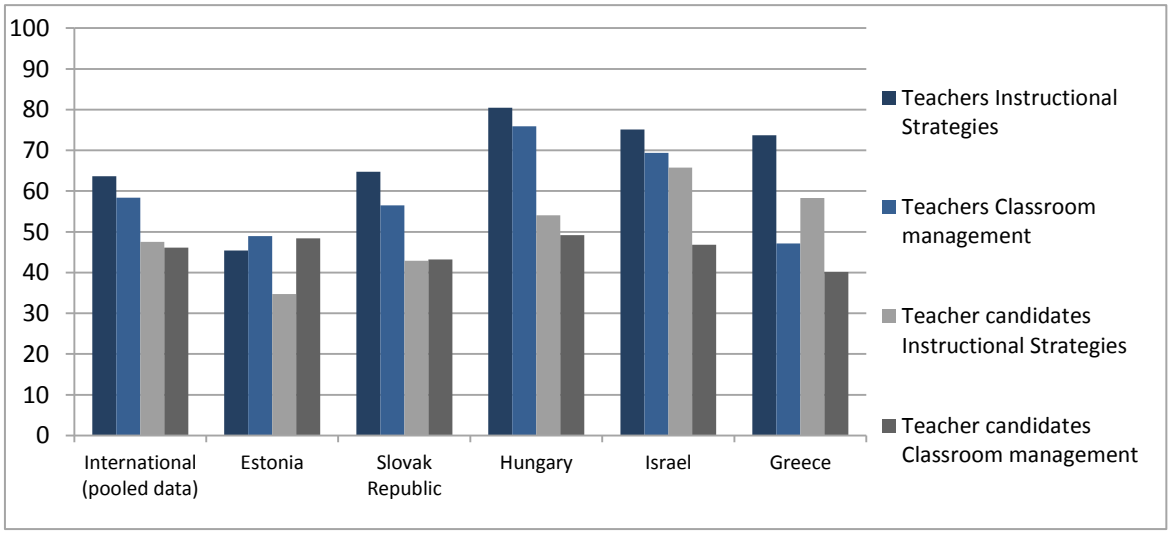
Table 6.1. Scales in the self-efficacy construct

Scale	Questions
Instructional strategies	Please indicate your opinion about each of the statements below. On a scale of 1 (Nothing/Not at all) to 7 (A great deal), how much can you do of each of the following:
Classroom management	
Student engagement	
Student Learning	On a scale of 1 (Not at all confident) to 7 (Completely confident), how confident are you that you can accomplish each of the following if you try? I am confident that…

The instructional strategies and classroom management scales asked teachers about their self-efficacy as related to practices and behaviours in the classroom. Findings showed that teachers and teacher candidates feel extremely efficacious in these domains (see Figure 6.1). Teachers reported the greatest self-efficacy when asked to what extent they could provide an alternate explanation or example to confused students, with over 90% of respondents from Hungary and Israel selecting 6 or 7 on this item[11]. Similarly, 61% of teacher candidates reported high self-efficacy when asked about their ability to resolve students' confusion. Classroom management was another area in which the majority of teachers expressed confidence, and between 40% and 50% of teacher candidates indicated the same.

[11] In the ITEL TKS, each item was presented on a 7-point Likert scale (1=lowest, 4= midpoint, 7=highest). The results reported in this chapter focus on the proportion of teachers who reported either a 6 or 7 per item.

Figure 6.1. Percentage of respondents who feel high self-efficacy in instructional strategies and classroom management



Motivational characteristics can influence teachers' decision-making in various ways, such as whether and how available knowledge and resources are used, or their engagement in professional development (see reviews in Blömeke and Delaney, 2012; Richardson, Karabenick and Watt 2014). It is important to contextualise self-efficacy within teaching practices, especially since teachers who exhibit higher self-efficacy tend to implement better strategies and have more positive experiences in the classroom and fewer disturbances (see Dicke et al., 2014; see Box 6.1).

Box 6.1. Teachers' self-reported practices: an example in use of assessment

The quality of instruction – i.e. how teachers implement their teaching approaches, what they do in the classroom, how they behave, what tools and materials they use – matters for student learning outcomes (Kunter et al., 2013). Teaching practices used tend to be influenced by factors such as teachers' beliefs about learning, cultural norms and experiences garnered through continued professional development. Thus, teachers' practices, rather than being viewed simply as a driver of professional competence, can also be seen more as an outcome. How a teacher employs strategies in the classroom will be based upon their motivational and affective competences, pedagogical knowledge base and professional decision-making capacities.

The TKS provides insight in teachers' instruction through some aspects of self-reported classroom practice in terms of instructional quality and classroom management (see Table 6.2 for constructs and scales). While these scales are subjective, they provide information on how teachers perceive their implementation of practices in the classroom. These scales were only administered to the teacher samples.

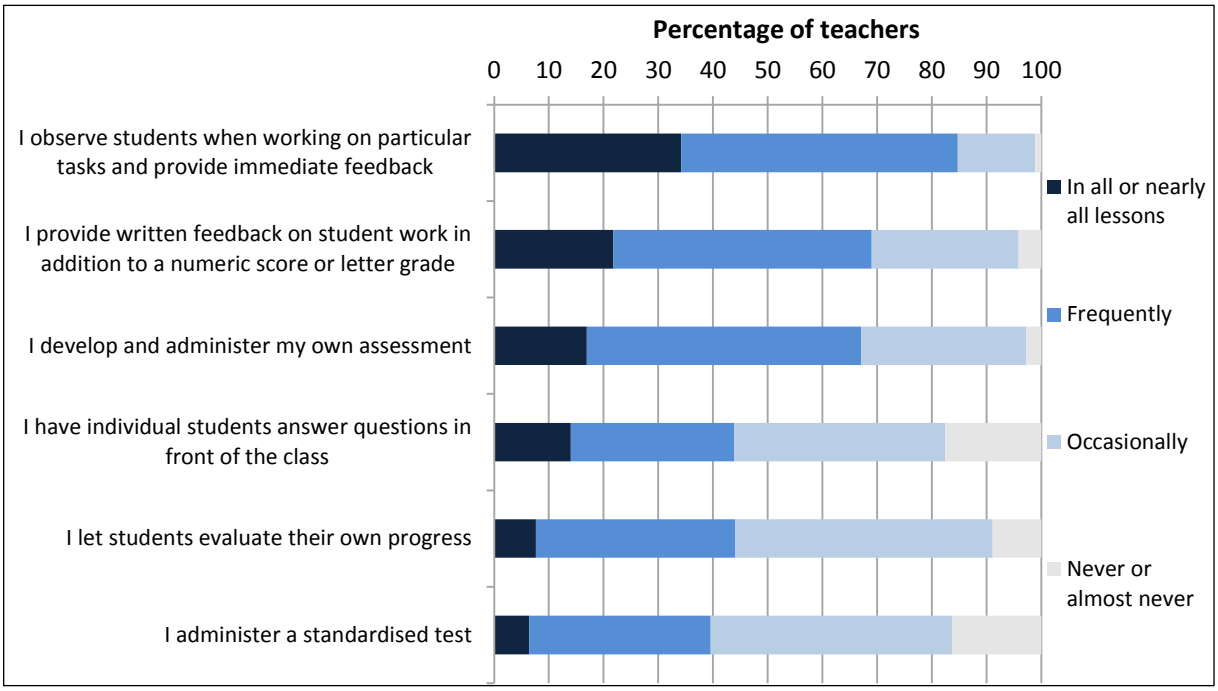
Table 6.2. Quality of teaching practice: constructs and scales in the ITEL TKS

Quality of teaching practice	Instructional Quality	Monitoring
		Cognitive Autonomy Support for Students
		Social Support for Students
		Use of Assessment
	Classroom Management	Dealing with Disruptions
		Teacher With-It-Ness
		Clarity of Rules
		Differentiation

Box 6.1. Teachers' self-reported practices: an example in use of assessment

Teachers varied in their reported use of assessment, however across all countries teachers consistently reported that they provided immediate feedback when observing students working on particular tasks at least frequently, if not in all lessons. Given the importance of feedback regarding student learning outcomes (Hattie and Timperley, 2007; Butler and Winne, 1995) these responses are promising. On the other hand, teachers were less likely to report letting students evaluate their own progress on a frequent basis. However this varied by country, and over 50% of teachers in Greece and the Slovak Republic reported allowing this frequently. Administering a standardised test is something teachers tended to report doing occasionally and very few respondents claimed to do this frequently or in all lessons (Figure 6.2).

Figure 6.2. Frequency of various assessment practices

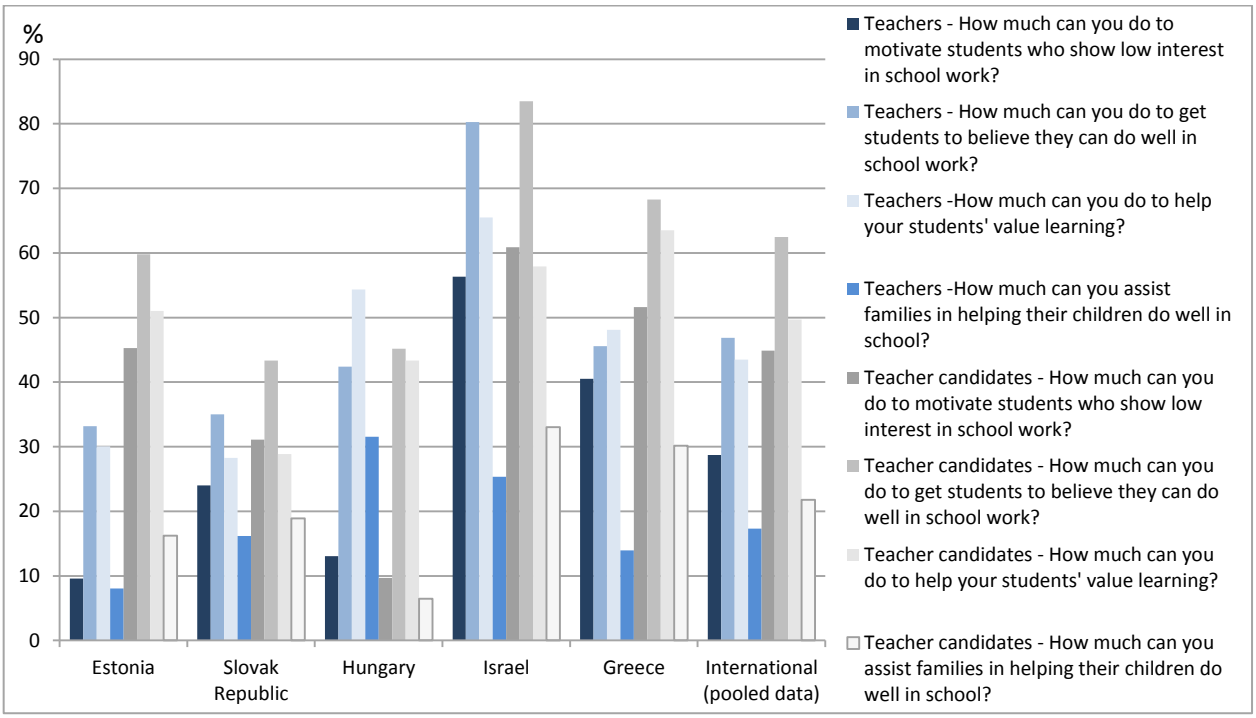


Further analysis of the ITEL TKS data suggests a relationship between self-efficacy and field experience in teacher candidates. As outlined in Chapter 5, teacher candidates were asked about both the quantity and scope of their field experiences during initial training. While there was little relationship between the quantity of experiences and self-efficacy, in some countries, the latter had a positive and significant correlation with self-efficacy in classroom management and instructional strategies. It is unclear whether this relationship is causal; however, if analyses on larger-scale samples uncover similar findings, then the argument to provide teacher candidates with broader field experiences becomes more compelling. It is also notable that the connection between scope of experience and self-efficacy varied by country. For example, a strong and significant relationship was found across both scales in the Slovak Republic and Greece, yet was not evident in other countries. This disparity could be due to differences in the quality of pre-service teacher training, as quantity of experience had little relationship with self-efficacy. Nonetheless, small sample sizes preclude clear conclusions; hence, a larger-scale study is necessary.

In general, the confidence teachers and teacher candidates reported feeling in classroom management and instructional practices is promising, especially given the significant relationships uncovered between self-efficacy and self-reported instructional quality across countries. While it is not

clear whether self-efficacy influences instructional quality, or vice versa, initiatives to boost teacher confidence could be beneficial. Moreover, although the relationship between scope of experience and self-efficacy is neither completely clear nor strong in the teacher candidate samples, preliminary results suggest that there may be a link in some country contexts that is worth exploring further.

Figure 6.3. Percentage of respondents who feel very efficacious in engaging students in school



Notably, only 34% of teachers indicated confidence in their ability to engage students in the classroom, whereas nearly 45% of teacher candidates reported feeling very efficacious on the student engagement subscale (see Figure 6.3). However, Hungarian teacher candidates tended to report low levels of self-efficacy in student engagement, with less than 10% affirming their ability to motivate students with low interest in schoolwork, and none answering "a great deal" when asked how well they could assist families in helping their children do well in school. In contrast, teacher candidates in the other four countries reported higher levels of self-efficacy on the engagement scale than did their teacher counterparts.

On the 'efficacy in student engagement' scale, responses to one item in particular stood out: across the Estonian, Greek, Israeli and Slovak samples, teachers reported lower levels of self-efficacy when asked how much they can assist families in helping their children do well in school (whereas in Hungary, teachers reported lower self-efficacy in terms of their ability to motivate students who show low interest in school work). Only 17% of teachers and 22% of teacher candidates across samples felt highly confident in their abilities to assist families. These figures are consistent with the proportion of teachers who feel motivated to invest personal time communicating with parents.

Professional teacher collaboration was positively correlated with self-efficacy in student engagement. The Pearson's correlation coefficient was significant for responses from Estonia, Greece, Hungary and the Slovak Republic, substantiating research suggesting that collaborative school culture explains some of the variance in teacher self-efficacy (Demir, 2008), and that having opportunities to observe successful peers can contribute to self-efficacy (Tschannen-Moran, Woolfolk Hoy and Hoy,

1998). These results indicate that by promoting teamwork and a collegial spirit, schools and teacher training institutions can foster collaborative practices and self-efficacy. With this in mind, it would be interesting to examine the impacts of collaboration and individual self-efficacy on collective efficacy

Teacher self-responsibility

The teacher self-responsibility construct consists of four scales, as outlined in Table 6.3.

Table 6.3. Scales in the self-responsibility construct

Scale	Question
Self-responsibility for student motivation	Imagine the following situations would occur in your classroom. To what extent would you feel personally responsible that you should have prevented each of the following? On a scale of 1 (Not at all responsible) to 7 (Completely responsible,) I would feel PERSONALLY responsible if…
Self-responsibility for student achievement	
Self-responsibility for relationships with students	
Self-responsibility for quality of teaching	

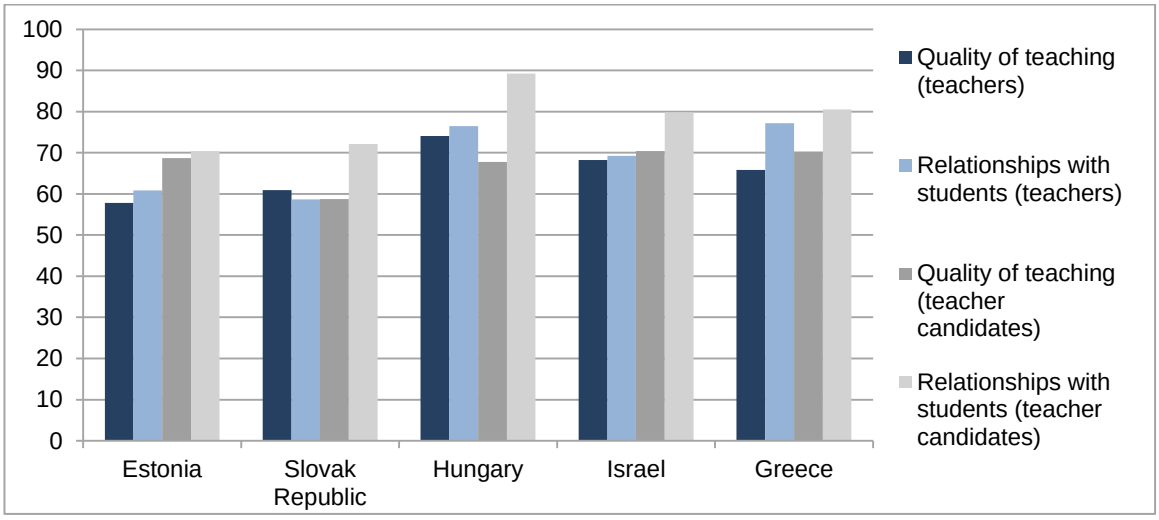
Personal responsibility has been defined as "a sense of internal obligation and commitment to produce or prevent designated outcomes, or that these outcomes should have been produced or prevented" (Lauermann and Karabenick, 2011). It can be approach or avoidance-oriented; approach-oriented suggests the intent to produce a specific outcome, whereas avoidance-oriented refers to preventing an outcome (Lauermann and Karabenick, 2013). As these scales are both conceptually and empirically distinct from teacher self-efficacy scales (Lauermann and Karabenick, 2013), they have been included in this survey. After all, contrary to previous conceptualisations that have conflated self-efficacy and self-responsibility (e.g. Guskey, 1987), feeling capable of doing something does not necessarily lead to a personal sense of responsibility about doing it. Consequently, teachers with similar levels of self-efficacy might differ in their feelings of self-responsibility (Lauermann and Karabenick, 2013).

Of the four scales, teachers reported feeling less responsible for student motivation and achievement, potentially because these can be attributed to other factors, such as perceived student deficits or a lack of adequate baseline knowledge due to previous poor teaching. Yet despite this commonality, it is important to consider potential profiles of responsibility. Some teachers may assume low levels of responsibility across all outcomes, while others may feel responsible only for their own teaching and not for student outcomes. Still others may take responsibility for both their teaching and their students' outcomes. The potential implications of such responsibility profiles warrant further consideration in terms of teachers' instructional behaviours and wellbeing (e.g., potential stress due to an inflated sense of responsibility).

Self-responsibility for quality of teaching and relationships with students

PISA 2015 shows a positive relationship between student-teacher relations and wellbeing, and also that students are less likely to report anxiety if teachers provide help when they are struggling (OECD, 2017b). Hence, teachers who prioritise fostering strong and positive relationships with their students can enhance student achievement and social and emotional wellbeing at school.

Figure 6.4. Self-responsibility in quality of teaching and relationships with students



Teachers generally reported feeling responsible for their quality of teaching and relationships with students, as shown in Figure 6.4. The majority responded that they felt completely responsible for whether their students felt cared for and could count on them for help. In terms of self-responsibility for quality of teaching, across all country samples, the highest proportion of teachers felt the most responsibility if "a lesson I taught failed to reflect my highest ability as a teacher". Teacher candidates showed a similar pattern of responses, and were most likely to report feeling highly responsible for relationships with their students, while teacher candidates in Hungary reported higher levels of perceived responsibility for each item in the scale. For example, over 95% of this group of respondents strongly agreed to feeling very responsible for students thinking they can count on them for help.

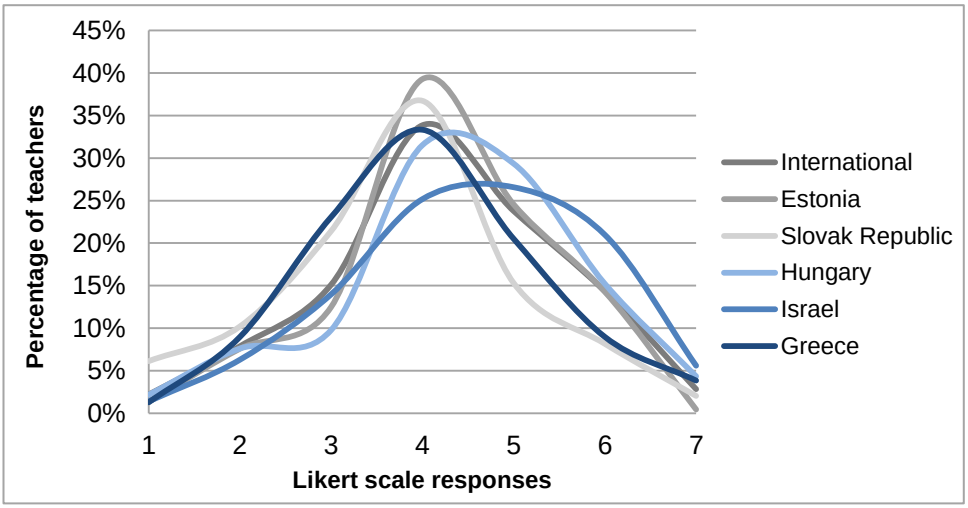
Self-responsibility for student motivation and achievement

Only 25% of teachers reported feeling completely responsible for student motivation, and fewer reported feeling completely responsible for student achievement. The largest proportion of teachers reported that they would feel highly responsible "if a student of mine did not value learning the subject that I teach". The item for which the smallest proportion of teachers (17%) reported feeling the personally responsible was "if a student of mine had very low achievement." However, results varied by country, with almost one third of Israeli teachers reporting feeling highly responsible for this item.

Box 6.2. Self-Responsibility for student learning: Examining the distribution

Teachers in the ITEL TKS consistently reported feeling low levels of personal responsibility for student achievement. Across most countries the majority of teachers chose "moderately responsible", with few teachers choosing response options on either extreme end. Israel was the exception to this pattern, with teachers reporting higher self-responsibility for student achievement.

Figure 6.5. Teacher responses to 'I would feel personally responsible if a student of mine had very low achievement'



Note: 1= not at all responsible; 7=completely responsible

While these results could be indicative of the "central tendency bias" to which self-reported measures are prone, not all items performed this way. This could suggest that teachers feel responsible for their students' achievement only to some extent. Are a small number of respondents who report feeling highly responsible for their students' achievement cause for concern? Potentially yes: If teachers believe the responsibility for student achievement rests on the students themselves, or on other, uncontrollable external factors, this could impact teaching practices. After all, "teachers who elicit strong achievement gains accept responsibility for doing so. They believe that their students are capable of learning and that they (the teachers) are capable of and responsible for teaching them successfully. If students do not learn something the first time, they teach it again, and if the regular curriculum materials do not do the job, they find or develop others that will" (Brophy, 1999, p.31).

While teachers cannot be expected to bear the complete burden of student achievement, higher self-responsibility may lead to more adaptive teaching practices and in turn, more successful learning outcomes. The results reported here are surprising and, if confirmed in a larger sample, would require more in-depth study.

Teacher candidates tended to report possessing a greater sense of responsibility for student motivation than for their achievement, with only 30% feeling very responsible for the latter (versus 23% of teachers). Teacher candidates in Estonia, Hungary and Israel reported feeling least responsible for students' low academic achievement; on the other hand, in Greece and the Slovak Republic, students' failure to learn required material prompted the weakest sense of responsibility.

Across countries, the relationship between self-efficacy and self-responsibility was stronger for teachers than for teacher candidates. This could be partially due to sampling; teacher samples were larger than teacher candidate samples. In any case, this finding suggests that there may not be consistency between teachers thinking "I can" (self-efficacy) and "I should" (self-responsibility), and

that being confident in one's abilities does not imply responsibility for outcomes. This is consistent with findings from Lauermann and Karabenick (2013), which distinguish between the two constructs.

Motivations for teaching

The motivations for teaching construct consist of four different subscales (outlined in Table 6.4).

Table 6.4. Scales in the motivations for teaching construct

Scale	Question
Ability	On a scale of 1 (Not at all important) to 7 (Extremely important), how important are the following reasons for your choice to be a teacher? I am a teacher because…
Intrinsic career value	
Extrinsic/personal career value	
Social Career Value	

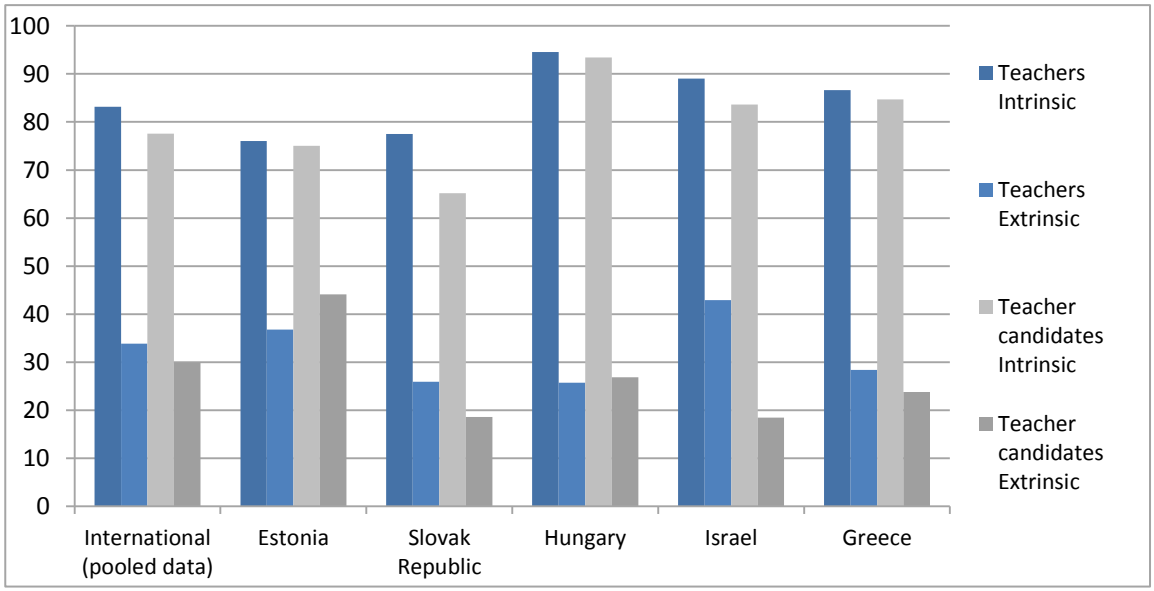
Overall, teachers tended to rank intrinsic factors as the largest motivation for a career in teaching, followed by ability and then social career value. Extrinsic motivators, such as income and job security, were rated among the lowest motivating factors. This is consistent with recent research suggesting that intrinsic value, experiences of positive teaching and perceived teaching abilities are major drivers for enrolment in teacher education programmes (Rothland, 2011; Watt and Richardson, 2007; Watt et al., 2012). Watt and colleagues (2012) examined factors that influence decisions to enter the teaching profession, based on expectancy-value theory. Their study, which included samples from Germany, Norway and the United States, found that perceived teaching ability, intrinsic value, social career values (i.e. making a social contribution) and working with children were some of the most highly rated factors that led to choosing teaching as a career.

Intrinsic versus extrinsic motivation

Teachers' intrinsic motivation has been shown to be an important predictor of student engagement, and that both intrinsic and extrinsic motivation of teachers can be predictive of student achievement (Demir, 2011), in each country, items concerning intrinsic motivation were consistently ranked as the most important inspiration for entry to the teaching profession (see Figure 6.6). The vast majority of respondents felt strongly that enjoying and having an interest in teaching was crucial to their decision to become a teacher. In contrast, teachers were less inclined to agree that extrinsic factors, such as income and job security, were important motivations. Overall, teachers were more likely to perceive job security to be an important reason to enter the profession (39%) than having a reliable income (33%) or a steady career path (29%). This might be explained by contextual factors: teachers in Estonia, Hungary and the Slovak Republic earn relatively less than other tertiary-educated individuals who are employed full-time in their respective countries (OECD, 2016a). Thus, it could be assumed that educated individuals who are motivated by factors such as salaries will choose other careers over teaching.

Over 40% of respondents in Estonia and Israel reported job security as an extremely important factor when choosing to become teachers. Fewer than 20% of Hungarian teachers cited income as an important motivating factor, while a similar proportion in the Slovak Republic reported having a steady career path was very important.

Figure 6.6. Percentage of teachers who report intrinsic/extrinsic factors as very important in the decision to enter teaching



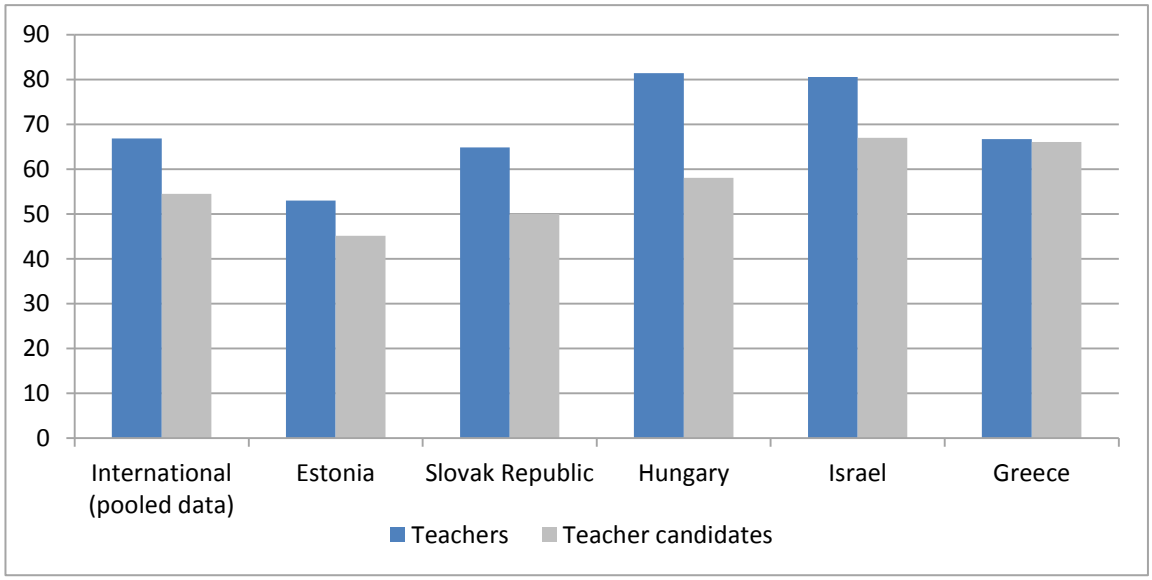
Teacher candidates also tended to rank intrinsic motivation above other scales in the motivations for teaching construct, and their responses were generally consistent with those of the corresponding teacher samples in their countries. The Slovak Republic was the one exception, wherein teacher candidates were less motivated by intrinsic factors and were also less likely than their teacher counterparts to agree that extrinsic factors, like salaries and job security, were important. Overall, teacher candidates showed a slight privileging of job security and a steady career path over salary considerations. While this difference was small across countries (except Hungary, which had a 10% gap between job security and income), many beginning teachers face precarious employment prospects, which may influence their pursuit of more extrinsic goals such as job security (Mansfield and Beltman, 2014).

Ability

While ability-related beliefs are generally a focal point of career-choice literature, this is less so the case in literature concerning teacher education (Watt and Richardson, 2012). There is much literature suggesting ability motivations are highly important in a number of country contexts, just as intrinsic value tends to be. This was demonstrated for example in work done by Watt and Richardson (2012) in Croatia, Germany and the United States, however interestingly not evident to the same extent when explored in Chinese and Turkish settings. In this sense, the authors concluded that individual abilities in a context with a large emphasis on collective culture such as China perhaps are less pertinent when choosing a career, and in a developing context such as Turkey other motivations such as job security are perhaps more at the forefront (Watt and Richardson, 2012).

Teachers across countries sampled in the ITEL TKS ranked ability as a highly motivating factor for entering the teaching profession, with over 50% of respondents reporting that having good teaching skills was important to their decision to become a teacher (see Figure 6.7). Over half of all teacher candidates in Greece, Hungary, Israel and the Slovak Republic reported that ability was an important motivator.

Figure 6.7. Percentage of teachers who report their abilities as very important in the decision to enter teaching



Across the board, teachers placed greater emphasis on ability than did teacher candidates, which may be explained by differences in experience, and hence confidence, especially as teachers tended to report higher self-efficacy across most domains. It would be interesting to compare teacher candidates and beginning teachers (i.e. those with under 5 years of experience) to see if there are noticeable differences in responses, or to control for experience when looking at ability as a motivation for entering the teaching profession. This change to include beginning teachings could be included in future studies based on the ITEL TKS (see Chapter 7 for further elaboration of this recommendation).

Social career value

Respondents were asked about the perceived value that teachers contribute to society and how this impacted their decision to enter the profession. 67% of teachers reported that the social contribution of teachers was an important factor in their decision to pursue the profession. This was the item with the highest response rate in all participating countries, barring Hungary. Over 60% of teachers reported that providing a service to society through teaching and being able to influence the next generation were priorities. In contrast, only 42% agreed that they were motivated by the potential to raise the ambitions of underprivileged youth, a factor that was consistently lower-ranked across countries in this scale. Among teachers, the Greeks were the only group to rank social career value as a more important overall construct than ability in their decision to enter the profession.

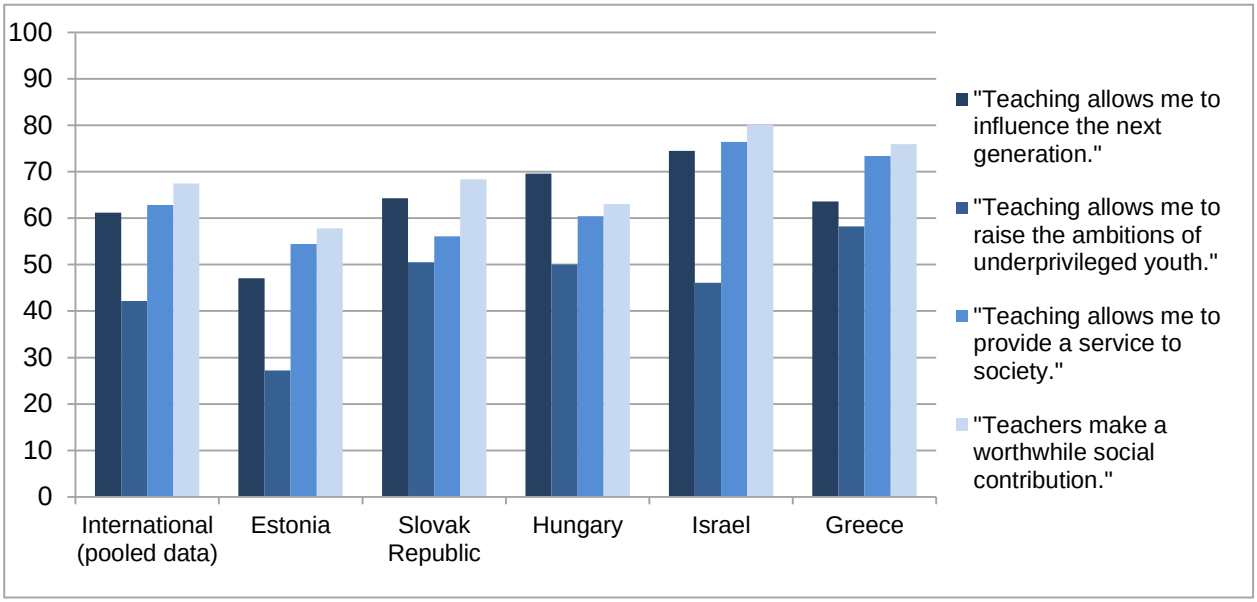
In contrast, the majority of teacher candidates reported that the social career value of teaching was very important when deciding to become a teacher. In fact, teacher candidates rated social career value above both ability and social goals. However, like teachers, teacher candidates generally indicated that raising the ambitions of the underprivileged was of lower importance, although over 80% of respondents in Greece reported this item to be very important, which was consistent with their tendency to report highly across the social value of teaching scale.

Box 6.3. Social career value in ITEL and TALIS

ITEL and TALIS both ask teachers about their perceptions of the social values of teaching. In ITEL, teachers are asked about "why" they entered teaching and the contributions they can make to society through the profession. On the other hand, TALIS asks teachers how they think society perceives them and the profession. This subtle difference allows us to explore how teachers think they can impact society, and in turn how this reflects back on them.

Estonia, Israel and the Slovak Republic all participated in TALIS (OECD, 2014b), in addition to the pilot ITEL TKS. Only 4% of those surveyed in the Slovak Republic agreed (or strongly agreed) that teaching is valued in society, in comparison to 13.7% of teachers in Estonia and almost 34% of teachers in Israel. These figures are in stark contrast to the views teachers held according to the ITEL TKS in terms of the services they can provide to society. Teachers were asked how important various social value motivations were to them (as shown in Figure 6.8)

Figure 6.8. Percent of teachers agreeing with the statement



Comparing TALIS and ITEL data, there appears to be a disconnect between how teachers value their societal contributions and how they estimate these contributions to be valued by society, which influences their decisions to enter and remain in the profession. According to TALIS, negative views of the teaching profession, whether by society or as perceived by the teaching workforce, can impact recruitment and retention of those in the profession. Hence, policies to enhance the prestige of the teaching profession could reduce the discrepancy between intended social contribution and the public's views. The ITEL TKS findings will need to be replicated on a larger scale with nationally representative samples in order to be confirmed.

Goal orientations

Four items in the ITEL TKS asked respondents how they feel about the quality of their relationships with students. Overall, 60% of teachers agreed strongly that their "main goal as a teacher is to show my students that I care about them;" for example 69% of teachers in the Slovak Republic agreed strongly with this statement, as did 65% of teachers in Hungary. Two items within this construct probed the difference between "caring" for students and "building relationships" with students, finding that teachers were more inclined to prefer showing students they are cared for over building relationships. Across countries, relationships between the social goals of teachers and their self-reported social support for students, as measured by the scales presented in Box 6.1, were strong

and significant, especially in Estonia, Hungary and the Slovak Republic. This is important because it shows that teachers' motivation for creating strong social bonds with students is reflected in their self-reported teaching practices, and vice versa.

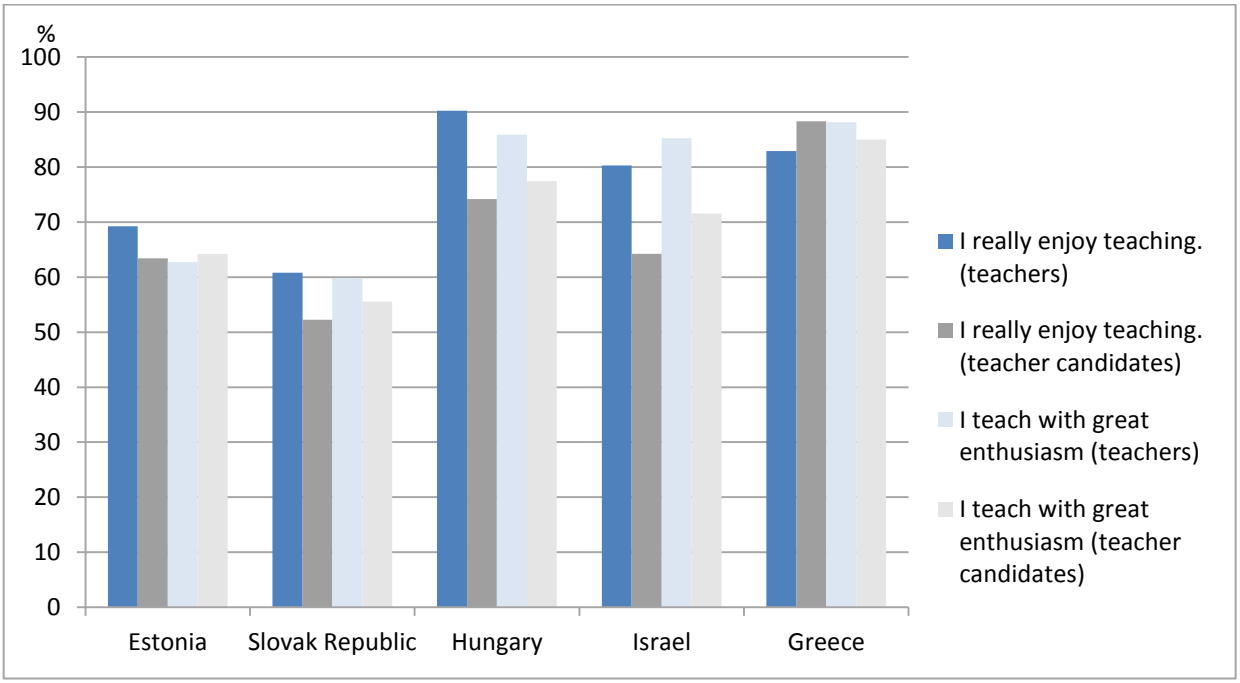
Responses to the social goals of teaching scale were similar for teacher candidates and teachers across all items. Interestingly, teacher candidates in Greece tended to more strongly agree with items regarding the social goals of teaching than did their teacher counterparts, whereas Hungarian teacher candidates showed the opposite pattern. However, these results must be interpreted with caution due to small sample sizes of teacher candidates in these countries.

Enthusiasm

Teacher enthusiasm is posited to be a key element of high quality and effective teaching (e.g. Brophy and Good, 1986), and can be divided into enthusiasm for teaching and enthusiasm for the subject (Kunter et al., 2011). Research suggests that teacher enthusiasm has a positive effect on a myriad of student outcomes, including achievement (Kunter et al., 2013), motivational, affective and behavioural characteristics (Patrick, Hisley and Kempler, 2000; Bettencourt et al., 1983), and student interest (e.g. enjoyment and intrinsic value, Keller et al., 2014).

The ITEL TKS, which only looked at this area in a general sense, found that teachers tended to report high levels of enthusiasm for teaching. When asked to what extent they agreed with the two items "I really enjoy teaching" and "I teach with great enthusiasm," between 80% and 90% of teachers in Hungary, Israel and Greece reported that they strongly agreed, while between 60 and 70% said the same in the Slovak Republic and Estonia. In contrast, teacher candidates tended to report lower levels of enthusiasm. Due to the benefits of enthusiasm for both student and teacher outcomes, it is important from a policy standpoint to consider factors that can enhance enthusiasm, especially in teachers' early years of entering the profession. In any case, the results from the ITEL pilot study are promising in that the majority of teachers and teacher candidates across countries reported high levels of enthusiasm.

Figure 6.9. Enthusiasm in teachers and teacher candidates



Overall, enthusiasm and self-efficacy in student engagement were found to be significantly correlated. Across the self-efficacy scales, student engagement tended to be strongest and most significantly related to enthusiasm. Teacher enthusiasm has, in relevant literature, been associated with affective and motivational outcomes, such as enjoyment and interest of students (Keller et al., 2014). Therefore, the relationship between self-efficacy in student engagement and enthusiasm makes sense, especially since successful experience can build self-efficacy for teaching (Tschannen-Moran, Woolfolk Hoy and Hoy, 1998). As teachers exhibit enthusiasm in the classroom, the enhanced motivational outcomes of students may reinforce feelings of efficacy and sustain enthusiasm for teaching.

Commitment to teaching

Many countries around the world experience problems of teacher shortages (Ingersoll, 2001; Loeb, Darling-Hammond and Luczak, 2005), which is in part due to the high rate of attrition within the profession. For example, in the United States, 25% of new teachers leave the profession before completing three years of teaching, and the figure rises to almost 40% when looking at those with under five years of experience (Chang, 2009). Furthermore, many teachers leave before reaching the age of retirement (McDonald, 1999). This disturbing trend of attrition is commonplace in education systems around the world, such as in Australia, China, England and Norway (Hong, 2010; Köber, Risberg and Texmon, 2005). In addition to the monetary costs, teacher attrition has wide-ranging impacts such as instability, inadequate induction and potential psychological and emotional effects on students that can negatively impact learning (Kersaint et al., 2007). Due to the strain that teacher attrition can place on education systems, uncovering factors that motivate teachers to show persistence and commitment to the profession is essential. Education systems can use this information to guide policy decisions concerning teachers, and can focus initiatives at the pre-service and in-service levels to decrease attrition and maintain a high-quality teaching workforce.

Table 6.5. Commitment to teaching scales

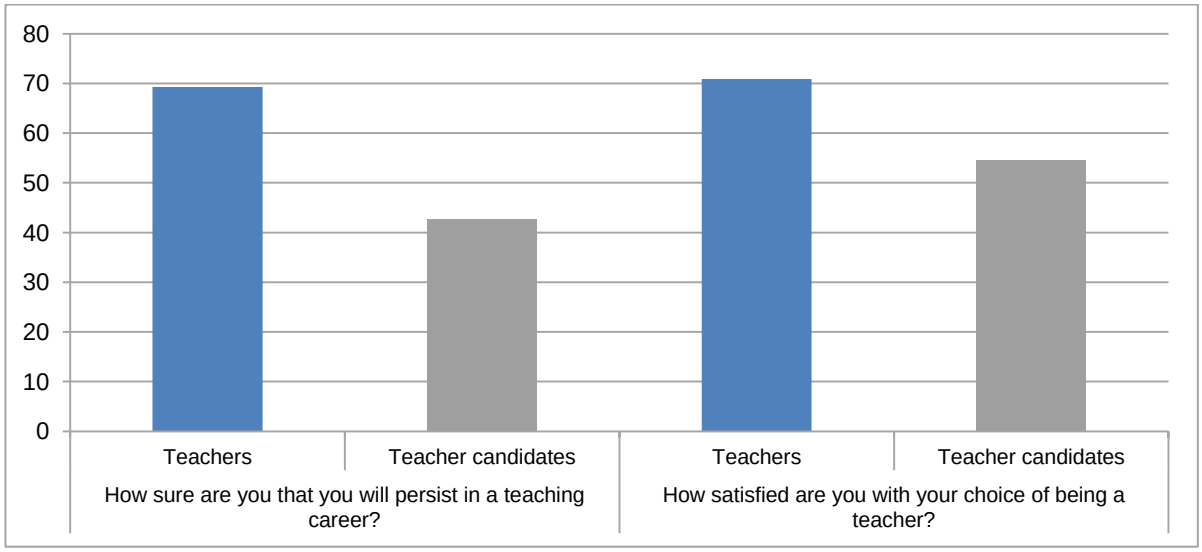
Scale	Questions
Planned Persistence	On a scale from 1 (Not at all) to 7 (Extremely), please rate how much you agree with each statement below.
Willingness to Invest Personal Time	On a scale of 1 (None) to 7 (Most of it), how much of your PERSONAL time are you willing to invest…
Interest in Professional Development	On a scale of 1 (Not at all) to 7 (Extremely), how important is it to you to participate in professional development activities that:

Planned persistence

Two items in the planned persistence scale asked respondents how sure they were that they would persist in a teaching career, and how satisfied they were with their choice of being a teacher. Respondents in Hungary, Israel and Greece were all consistent in their answers, with over 75% of teachers reporting that they were very sure they would persist in a teaching career. Over 50% of teachers in Estonia and the Slovak Republic reported having the same certainty, and indicated that they are satisfied with their choice to become a teacher. Respondents in Estonia showed the largest gap (10%) between the two items in this scale, with more teachers strongly agreeing that they were satisfied with their choice to teach, but fewer being convinced that they would persist in the profession.

Across countries, teachers responded higher on the planned persistence scale than did teacher candidates. There was also less differentiation between the two items in this scale for teachers, whereas teacher candidates were more likely to be satisfied with their choice of becoming a teacher, but less sure that they would persist (55% versus 43%, respectively). This trend may reflect generational differences in terms of the labour market and millennial career paths; however it could also be due to selection bias of the sample, as there is a possibility that only the most motivated teachers and teacher candidates agreed to participate in the study. Consequently, using nationally representative samples will allow for more thorough exploration of these underlying factors.

Figure 6.10. Planned persistence in teachers versus teacher candidates: pooled data



Determining the factors that incentivise teachers to remain in the profession is important for tackling the attrition problem in many education systems. For example, intrinsic motivation correlated

highly and significantly across countries with the planned persistence scale. Self-efficacy was also positively correlated with planned persistence, although to a lesser extent. These results can suggest that education systems might focus on recruiting those who are intrinsically motivated into the profession, and provide opportunities to enhance self-efficacy in teacher training and through professional development.

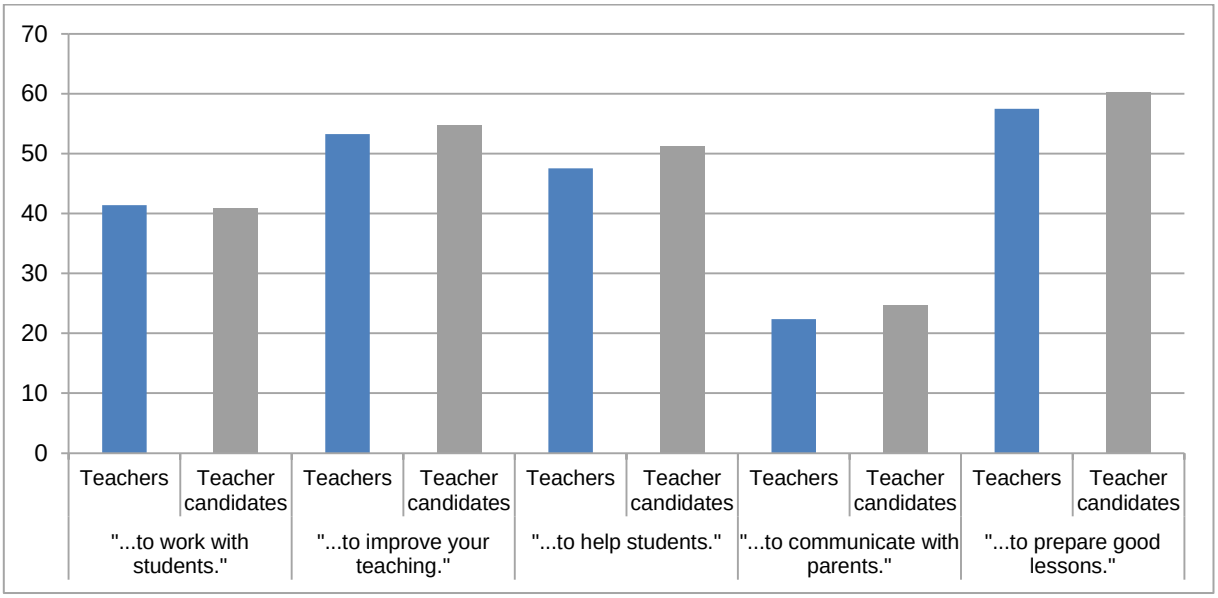
Personal time

Teachers tend to report high levels of stress associated with the profession, and research suggests that excessive workloads are predictive of emotional exhaustion, intentions to leave the profession and attrition in countries such as Norway and England (Skaalvik and Skaalvik, 2011; Smithers and Robinson, 2003). Time pressures, and more specifically feeling that there is not enough time to complete work while maintaining an adequate standard, have also been shown to influence commitment towards teaching (Kyriacou and Kunc, 2007). OECD data reveals that teachers in the Slovak Republic spent 186 days teaching versus the OECD average of 181 days, while in Israel, net teaching time has increased by 16% from 2000 to 2014 (OECD, 2016a). These figures highlight the time commitment of teaching, and may indicate why teachers may not be willing to invest personal time in tasks above their usual workload. Using personal time for work-related activities could show a high level of dedication to the profession, but without the proper protective measures in place to prevent excessive overtime work, such efforts can detract from the wellbeing and work-life balance of teachers.

The majority of teachers indicated that they spend most of their personal time firstly on preparing good lessons (58%), and secondly on improving their teaching (53%), although responses still varied from country to country. Teachers in Hungary were more likely to respond that they would spend personal time on improving teaching (57%), whereas in Greece, teachers stated that they would spend most of their personal time preparing good lessons (86%). Yet consistently, teachers across samples were least likely to invest personal time on communicating with parents. These trends may reflect the diverse expectations placed on teachers in different education contexts.

Teacher candidates were slightly more willing than teachers to invest personal time in school-related activities, with 60% reporting that they prioritised dedicating personal time to lesson planning, and 55% electing to improve their teaching. Consistent with the teacher sample, teacher candidates were also the least likely to report spending much personal time on communicating with parents (see Figure 6.11).

Figure 6.11. Willingness to invest personal time across the pooled sample



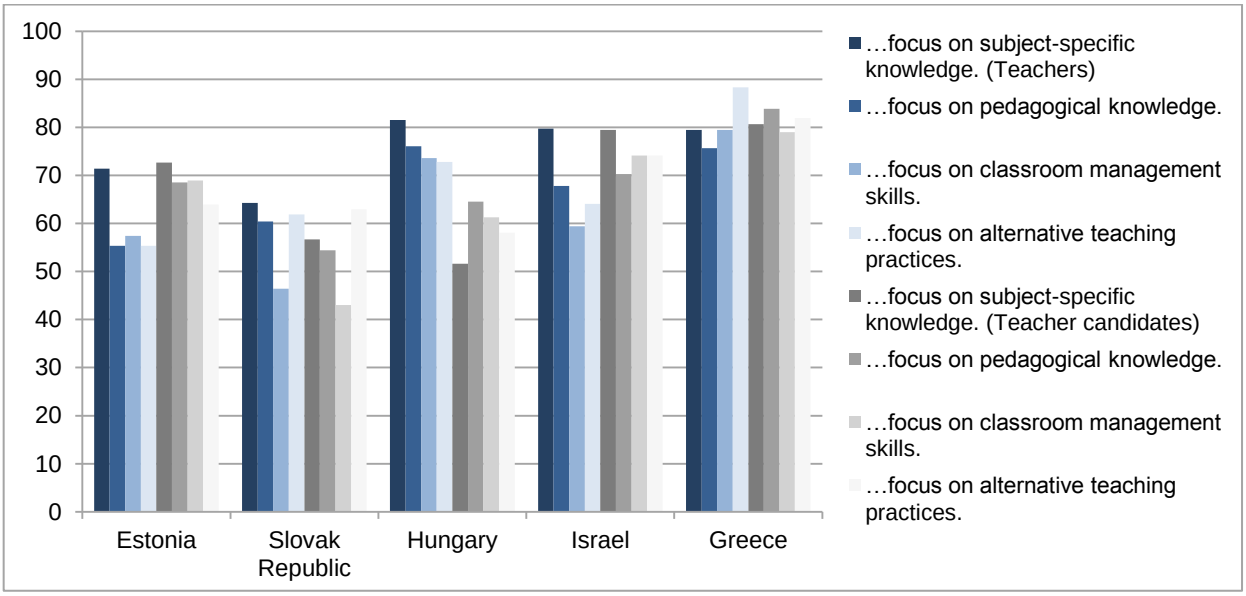
There was a strong and significant correlation between self-efficacy in assisting families and willingness to invest personal time communicating with parents; however it is unclear whether self-efficacy in assisting families is predictive of willingness to invest personal time communicating with parents or vice versa. The correlation was stronger for teachers than for teacher candidates, which could perhaps be explained by differences in experience.

Professional development

There is much research supporting the notion that teacher quality influences student achievement, and that the professional development of teachers is linked to school improvement and student academic outcomes (see Darling-Hammond, 2000; Villegas-Reimers, 2003; Yoon et al., 2007). Across the professional development scales, developing subject-specific knowledge was repeatedly cited by teachers and teacher candidates as being extremely important. For instance, in the teacher sample, respondents in each country except Greece placed the highest importance on this area (see Figure 6.12). In contrast, Greek teachers and teacher candidates were most likely to report that focusing on alternative teaching practices was of high importance; Greek teacher candidates also tended to prioritise pedagogical knowledge. More generally, respondents from Greece consistently reported that professional development in all four areas of teaching is crucial (see Figure 6.12).

The majority of teachers and teacher candidates reported that each category of development was of high importance. The exception was the Slovak Republic, where less than 50% of teachers and teacher candidates found focusing on classroom management skills in teacher development to be very important. This is especially interesting when we consider that across the self-efficacy scales, teacher candidates in the Slovak Republic reported the highest self-efficacy in classroom management, while teachers reported the highest self-efficacy in instructional strategies, followed by classroom management. However, across countries in the pilot ITEL TKS, there is little evidence to suggest that a relationship between self-efficacy and professional development in classroom management exists.

Figure 6.12. Interest in professional development in teachers and teacher candidates



Conclusions and recommendations

Teachers and teacher candidates showed varying patterns across the different constructs in the teacher motivation dimension. In general, data collected in the pilot is consistent with the literature: teachers are more motivated by intrinsic than extrinsic factors; self-efficacy and self-responsibility are related yet distinct from one another; and planned persistence is strongly related to intrinsic motivation. If findings are consistent in larger-scale research with nationally representative samples, they could serve as important evidence to be used to enhance teacher policies and teacher education standards across countries. Therefore, recommendations for a large-scale study include:

1. *Keep a focus on motivation and more thoroughly align knowledge and motivation scales*

Although the motivation scales produced poor correlations with the pedagogical knowledge items, this does not necessarily mean that motivation is not predictive of knowledge, or vice versa, as we must consider the small sample sizes and the relatively high performance of teachers on the assessment scale of pedagogical knowledge versus the learning processes (see Chapter 4). As the consistent and strong correlations between motivation, teacher quality and various OTL items show, motivation can be a driver of professional competence. In future work, it would be beneficial to further refine the instrument, including explicitly aligning motivational constructs with knowledge items and collecting larger sample sizes. Such changes would facilitate further evaluation of the relationship between knowledge and motivation, as well as between motivation, teaching practices and OTL.

The link between motivation and self-reported classroom practices was clear in this pilot study, which is promising. It is important to note that motivation constructs were more consistently and strongly linked to self-reported teacher practices and commitment to teaching than they were to knowledge. This indicates that pedagogical knowledge is only one aspect of overall teacher quality; hence, even if its connection to motivation is not strong, the rationale for maintaining motivation instruments in future work still holds.

2. Establish the intentions of teacher candidates in entering the profession

Generally speaking, students enter teacher education programmes with the intent to pursue the teaching profession. However, some view a teaching degree as a way to open doors to a range of job opportunities, not only those in the education field (Rots et al., 2010). Research has uncovered that some teacher candidates are ambivalent about entering the profession, even as early on as at the beginning of their programmes. To illustrate, Roness and Smith (2009) found that in a sample of Norwegian teacher candidates at the beginning of their training, almost 25% were uncertain about whether they would ever enter the teaching profession, while a subsequent study suggested that a similar proportion were still unsure at the end of their studies (Roness and Smith, 2010). Consequently, it is important to ask teacher candidates whether or not they intend to enter the profession. Those who enter teacher training yet hope for alternative career paths could show different patterns in the motivation constructs, especially in domains such as social career value and intrinsic motivation. Further research on this category of teacher candidates could provide interesting insight to countries into how teacher education serves not only teaching professionals, but also those interested in working in other sectors of the labour market.

3. Maintain use of a 7-point Likert scale

Although TALIS uses a 4-point scale to measure self-efficacy, this pilot used a 7-point Likert scale, and it is recommended that future ITEL studies do so as well. The decision to employ the 7-point scale was made in part because the lowest answer options (i.e. not at all) are rarely used, as was the case with TALIS, and because a 7-point scale allows for greater differentiation and understanding of discrepancies within self-evaluation. Bandura (2006) concluded that 0-100 (or 0-10) scales have a higher predictive validity than do 5-point scales, which is true as well for 7-point scales in comparison to 4-point scales, although these have the additional benefit of being less likely to fatigue respondents than would a larger point scale.

CHAPTER 7: THE PENDING AGENDA

Introduction

Teachers are expected to process and evaluate new knowledge relevant to their core professional practice and to regularly update their profession's knowledge base (Guerriero, 2017). As explained in Chapter 1, pedagogical knowledge (i.e. knowledge of teaching and learning) refers to the specialised body of knowledge teachers possess that creates effective teaching and learning environments for each and every student. There is agreement that a high level of pedagogical knowledge is part of competent teaching, yet there remains the need to assess teacher knowledge as an outcome of teacher education systems and as a predictor of effective teaching and student achievement. This includes teaching practicum and professional development, as well as broader issues, such as how teachers' knowledge relates to motivational factors and incentives for choosing the profession.

The CERI Innovative Teaching for Effective Learning (ITEL) project set out to explore these issues, guided by three policy challenges:

1. To what extent do teachers have the knowledge and skills required for teaching 21st century skills?

2. To what extent are initial teacher education programmes providing teacher candidates with opportunities to learn the knowledge and skills required for effectively equipping students for the 21st century labour market?

3. Can the quality of the teaching workforce be improved by having a better understanding of the factors that drive teacher professional competence?

Chapter 1 provided an overview of how these broad policy challenges were operationalised into specific research questions that explored the strength and weaknesses of teachers' pedagogical knowledge base. A carefully constructed conceptual framework was designed with three broad dimensions of teacher pedagogical knowledge: Instructional processes; Learning processes; Assessment (see Table 1.1). This framework was used to design the ITEL TKS assessment items for the pilot study. The instrument aimed to analyse the relationships between learning opportunities and knowledge as well as motivational factors and other drivers (e.g. decision-making and professional judgement, see Figure 1.1 for the conceptual model) of teachers' professional competence.

The ambition is great: in order to continue to improve teaching and learning, the quality of the teaching workforce must also be enhanced. This requires both a better understanding of what constitutes quality teaching, as well as the designing of systems that attract and recruit the strongest potential teachers to the field. Understanding the best way to achieve these aims – in terms of system design, the required incentives and support, and the human element – means going into what has hitherto been generally referred to as the "black box" in teaching: teachers' professionalism and their knowledge base. In this sense, the ITEL TKS is designed to complement, rather than compete with, the TALIS survey, by establishing a stronger survey design that goes beyond self-reporting. This reduces the risk of social desirability bias in self-reported responses, and also allows for potential

triangulation of the ITEL TKS assessment data with other response types (e.g. self-report and/or situational judgements etc.). At the same time, it does not individually assess teachers, instead positioning itself as a useful research and policy tool for system level analysis.

Of course, the ITEL TKS cannot capture teachers' professional competence in its full complexity. Nor can it be regarded as a universal norm for teacher knowledge. Nevertheless, it is a starting point for better understanding the nature of teachers' pedagogical knowledge and how it evolves throughout their careers.

Developing teacher knowledge profiles

One of the innovative features of the ITEL TKS is the construction of profiles that capture the relative strengths and weaknesses of the teacher pedagogical knowledge base as it relates to the three dimensions of the framework. As instructional processes, learning processes, and assessment are all core elements of teacher knowledge, teachers, teacher candidates and teacher educators would ideally perform well on all dimensions and exhibit a balanced pedagogical knowledge base. This includes both practical and theoretical knowledge that is regularly updated with the latest research findings, including from the learning sciences.

A balanced pedagogical knowledge base could signal to countries that the system of teacher education and ongoing professional development is well-designed and achieving its goals, at least as they relate to the preparation and development of teachers and teacher candidates. However, if one of the groups (for example, the teacher candidates) exhibits significant strength on one particular dimension and weakness on one or two of the others, this would be useful for identifying gaps in the professional knowledge base, and would provide food for thought for designing policy and education interventions to best reflect national priorities.

It is important to reiterate that this work is not based on normative assumptions, and countries are not expected to all have the same goals or aims. For example, certain countries/regions might place a particular emphasis on one of the three dimensions (e.g. assessment, or learning process; see Chapter 4 for the set of possible profiles). The profile would then reveal whether or not those priorities were being met. If they were not, it might also help to identify which element could be usefully strengthened, through teacher education, field experience, ongoing professional development, or formal or informal teacher collaboration. As the ITEL TKS assessment also distinguishes between core knowledge items (based on traditional research and long-standing theoretical work) and 21st century knowledge items (those relating to newer developments in the learning sciences and neuroscience, for example; see Chapter 1 for full details), it could potentially also help isolate the type of input and development needed. Here it should be reiterated that analysing these profiles from a policy perspective does not imply that the solutions should come in a top-down fashion. Rather, linking back to the discussion in Chapter 1 on professionalism and autonomy, the intention is to highlight the importance of empowering teacher educators and teachers themselves to take charge of their knowledge base.

Knowledge as a complex system

There are several cautions needed here. First, **this design is not intended to be, nor should it be interpreted as, a simple linear model of inputs and outputs**. The development, transmission, and evolution of a professional knowledge base can be likened to a complex system that is constantly adapting and changing (Guerriero and Révai, 2017; see Snyder, 2013, for an overview of complexity theory in education). Complex systems have the following core components (Sabelli, 2006):

- Behaviour is not explained by the properties of the components themselves, but rather emerges from the interaction of the components.

- The system is non-linear and relies on feedback to shape its evolution.

- The system operates on multiple time-scales and levels simultaneously.

In terms of understanding teacher knowledge, this implies that the elements of any particular system can no longer be examined in isolation. Rather, the study of complex systems requires a step back to look at how the various interconnections can form a coherent whole (Burns and Köster, 2016). For the ITEL TKS, interpreting the profiles thus requires serious contextualisation, including a comprehensive overview of the system of teacher education and recruitment, ongoing professional development and retention, and the role and knowledge base of the teacher educators themselves. Chapter 3 sets out an early effort at this, with system overviews and institutional interviews to help contextualise the results of the pilot. A more elaborate version will be needed, incorporating a better understanding of the system dynamics over time (as well as a representative sample), in order to be able to draw useful policy conclusions from the profiles.

As Chapters 1 and 5 make clear, knowledge and learning can be conceptualised in various ways, and looking at individual knowledge is only a first step in understanding how a profession's knowledge base develops and grows (Guerriero, 2017). The community of practitioners directly and constantly shapes its own knowledge base through continuing professional development, professional networks, or collaboration with colleagues. Professional networks also provide opportunity for cooperation between different actors, in particular, teachers and researchers. Practitioners interpret, translate, apply or adapt a variety of materials such as textbooks, policy documents, educational media or technology in unique ways, and these interactions shape their knowledge. Research exerts impact on teacher knowledge often through intermediary processes, in which interactions between human and material elements are involved (Guerriero and Révai, 2017).

Chapters 4 and 5 provide a set of recommendations that would allow the ITEL instrument to better capture some of these issues from a research perspective. From a policy and practice perspective, it would also be important to think more about the set of actors and mechanisms involved in creating and strengthening the structures and processes for developing teacher knowledge. Who is responsible to whom, and for what purpose?

Developing standards and the professional knowledge base is, in many professions, a self-governed activity (Guerriero, 2017). In education, professional accountability involves practitioners holding each other accountable for their practices, both within specific schools and through working together in professional organisations and networks (Groundwater-Smith and Mockler, 2009; Morris, 2004). Professional accountability activities include mentoring, collaboration, and peer review, all of which serve to strengthen teacher agency (O'Day, 2002).

Yet the profession is not exclusively self-governing. The state plays an important role in governing teacher knowledge, for example through the creation of accountability systems and regulatory frameworks. Setting professional standards, school and teacher evaluation mechanisms (e.g. inspection) and introducing national testing schemes represent expectations that teachers must meet, and develop their knowledge base accordingly. Similarly, regulating teacher education is also a strong tool by which teacher knowledge is shaped. Where teacher education takes place (e.g. at the university, at a school or a specially designed teacher training academy) and who teacher educators are (e.g. researchers or expert teachers) strongly influence the kind of knowledge base teachers will have. This suggests that the governance of teacher knowledge is multi-faceted and involves teachers and

teacher professional organisations, as well as actors from Ministries, Inspectorates, Universities and other teacher training institutes, at a minimum.

This current paper reflects on these issues in the context of a pilot study, and thus carefully refrains from making more than suggestions of interesting findings that would be important if borne out in a study with a representative sample. This is important from a research perspective, and it is also crucial for understanding how the ITEL TKS might eventually be used to guide policy.

The ITEL pilot: Results and reflections

The ITEL pilot ran in five countries (Estonia, Greece, Hungary, Israel and the Slovak Republic), sampling from three sets of respondents: teachers, teacher candidates and teacher educators. As described in Chapter 2, the pilot was able to successfully validate the viability of the approach and the majority of the items in the assessment instrument. The validation process also allowed for the identification of items that can be further refined or improved for future work.

The results of the assessment provide food for thought, both on how to improve the instrument and also on their implications for research and policy if they were to be replicated in a larger sample. As outlined in Chapter 4, the Assessment dimension was dominant across all groups and countries sampled. While this might be an artefact of the instrument, it could also reflect the importance placed on assessment and evaluation, and the efforts taken in many contexts to build a culture of evaluation into the system, potentially at the expense of the other dimensions (OECD, 2013). If so, however, this would act against the general perception (and findings from this pilot) that teacher practice is not as up to date or tied to research as it could be. Further research is required to tease apart these possibilities and also better understand the absence of the Learning profile from the pilot results.

Another interesting finding is the lack of relationship between knowledge profiles and opportunities to learn. As set out in Chapter 5, this can be explained in a number of ways, including technical arguments related to the survey instrument as well as theoretical explanations to do with the nature of teacher learning. A number of recommendations on how to respond to these issues is suggested in Chapter 5 and will be further elaborated on at the end of this chapter.

Lastly, the ITEL TKS looked at teachers' beliefs, work-related motivation and professional self-regulation, as well as the interaction of these with pedagogical knowledge. Empirical studies on teacher quality have shown that while general pedagogical knowledge is relevant for high-quality instruction, teachers' affective-motivational characteristics also matter (see Chapter 6). Hence, a comprehensive model of teachers' competence includes the transformation of knowledge into practice. The ITEL TKS contained some surprises in this regard, most notably in the responses to intrinsic/extrinsic motivation and reported levels of responsibility for student outcomes. There is great potential to exploit synergies with the TALIS work and PISA data from the teacher questionnaire for further analysis.

Conclusions and recommendations for next steps

The ITEL TKS Pilot Study demonstrated the feasibility of researching teachers' pedagogical knowledge profiles across countries, and validated an innovative instrument for assessing general pedagogical knowledge in an internationally comparative way. It has also allowed for reflection on potential adaptations to strengthen the design of future work. As a complement to the set of recommendations presented in each chapter, below is a series of global recommendations based on the findings of the pilot study, as well as suggestions for possible improvements and additional topics.

Include sample of new teachers in the main study

The knowledge base of new teachers is potentially interesting on a number of levels: first, having just recently left teacher education, it represents and an up-to-date and complete look at the ways in which initial teacher education is preparing teacher candidates for their entry into the profession. In addition, it has been argued that the knowledge gained in initial teacher education undergoes potentially radical change when confronted with the reality of the classroom and the views and knowledge of more experienced colleagues (Dicke et al., 2015b; see Chapter 5 for more thorough discussion).

In addition to their transition to the workplace, new teachers face a number of other challenges, some of them systemic. Oftentimes, "difficult" schools, such as those with a high proportion of immigrant students, those in rural or remote areas, or those with a low socioeconomic profile, tend to be staffed by new rather than experienced teachers (David, 2008; OECD, 2010). These stresses, in addition to the "practice shock" mentioned above, likely contribute to the high attrition of new teachers. Better understanding how these systemic issues interact with the transforming knowledge base of a new professional might be useful in developing strong induction programmes that could help improve the retention of this group.

The ITEL pilot survey did not explicitly sample new teachers as a group, although they were included as an option in teacher candidate samples when participating countries did not have sufficient sample sizes meeting the group's criteria (see Table 5.1). While the pilot explored the pedagogical knowledge of teachers with between 5 and 15 years of teaching experience, future work can include new teachers as a specific sampled group. This would allow for an empirical look at the pedagogical knowledge new teachers possess, and the transformation it undergoes in the first stages of adjusting to the work and the induction into the profession.

Keep the quantitative approach and the multiple dimensions of analysis; further develop the instrument

The ITEL TKS is unique in that it allows for an internationally comparative, objective assessment of teachers' competences, including their pedagogical knowledge and affective-motivational beliefs. By making it possible to relate knowledge and competencies directly to features of teacher education, the TKS could help improve teacher policies in OECD countries. To complement the recommendations presented in Chapter 2, we suggest that future work would benefit from a more developed instrument that accounts for the complex nature of teacher knowledge. In particular, including a set of items that better measure competence with regard to judgment and decision-making in teaching would strongly enhance the instruments' analytical potential. How do teachers apply their theoretical knowledge in classroom situations to design and select their teaching approaches? How does this adapt and change over time? Examining differences in responses between teacher candidates, new teachers, and experienced teachers could allow us to begin answering these questions. A more formal (and rigorous) method would involve collecting panel data over multiple time periods, which would capture the development of teaching practices and approaches at different stages of the career.

While the piloted assessment instrument contained so-called "practice-based items", those that were purely practice-based (as categorised by independent experts) were in the minority. A number of potentially practice-based items also tended to measure theoretical knowledge. One possible reason for the low number of entirely practice-based items is the fact that only multiple-choice items were used, which necessitated one clearly justifiable correct answer based on research evidence. The inclusion of other types of items, such as open-ended questions, video-based or situational judgement items may enhance the instrument. The analysis of such items, however, requires significantly more resources.

Developing the instrument to measure theoretical knowledge as well as broader competences could also potentially improve the predictive capacity of how learning opportunities are related to knowledge. Parts of the assessment measured specific theories and concepts of learning sciences. By drawing upon a set of knowledge components (instead of only one) to measure broader competence in teaching practices, the instrument would more accurately situate the knowledge obtained (e.g. how to monitor a certain classroom situation) and its link to previous learning opportunities. It could also begin to determine the role of informal knowledge in developing professionalism and how it interacts and develops with formal knowledge gained from teacher education and professional development.

Focus on the social construction of knowledge

Knowledge and learning can be conceptualised in various ways; hence, examining individual knowledge is only the first step to understanding how the profession's knowledge base develops and grows (Guerriero, 2017). Knowledge is social, because it is shared and developed through experience and practice (Putnam and Borko, 2000). The way teachers share and construct knowledge in their social-professional environment has been captured in research studies including the investigation of teacher collaboration, communities of practice, teachers' activity and professional learning, learning organisations, to mention a few. Social network research is particularly relevant, as it seeks to explain variation in outcomes such as knowledge or performance as a function of social ties (Borgatti and Foster, 2003). Another fascinating area of study looks at the phenomenon of knowledge sharing and effecting large-scale change as a case of contagion through social networks (Centola and Macy, 2007), wherein a simple "contagion" of ideas can be spread after contact with just one "infected" neighbour (e.g. a colleague). This concept can be distinguished from complex contagion, which is more about changing behaviours and thus requires multiple exposures before lasting change in behaviour can be effected.

Collaborative learning, expert advice and guidance, action research in the classroom and mentoring are only some of the ways that teachers learn and share knowledge across individuals and their profession. Some of this knowledge is formalised and constructed, while some is informal and may be codified as a set of judgements and heuristics, rather than as more theory-based knowledge. Given this range, it is not just the method of learning or transmission that differs, but potentially the kind of knowledge, how it is stored, and how it is accessed in classrooms and during teaching practice.

To complement the recommendations presented in Chapter 5, we suggest that future work investigate how teachers construct a shared knowledge base, how it is defined, and how it affects individual knowledge. These questions could explore how and when knowledge is developed socially, the kinds of knowledge that exist, their relationship to teaching practices, and how they relate to formalised individual opportunities to learn, as well as teacher motivational characteristics.

Include the role of technologies in teaching and learning

Technology is an integral part of the modern world. Digital technologies have been argued to allow for a more flexible, learner-centred notion of education that facilitates the development of curiosity, creativity, collaboration, and other "soft skills" vital to 21st-century societies (Livingstone, 2012). Yet concerns persist about the uptake and use of technology in the classroom by teachers. The TKS Pilot Study did not explicitly look at technology, either as an aspect of general pedagogical knowledge (e.g. for developing individualised learning plans, or to facilitate lectures on complex topics), as a platform for knowledge sharing between teachers, or as a mode of knowledge-transmission in a teacher's education and training.

This omission can be rectified in future work. As a first step, a series of questions on technology as it relates to general pedagogical knowledge, including lesson planning, classroom management and assessment and evaluation practices, could be introduced in the survey. These would have the benefit of illustrating changes over time (based on the length of time in the profession and experience of teacher candidates compared to teachers) as well as allowing for research into the use of technology by teacher educators. The technology theme could also be integrated into the opportunities to learn component as a way to tease apart the modes of delivery of knowledge and the resulting knowledge base that is developed. This theme overlaps with many of the other issues highlighted already, such as the social aspect of knowledge as advanced through online communities (including Facebook and other social media), the use of community platforms, and virtual peers acting as mentors.

Explore multiple methodologies

Other methodologies could also be used to expand the strength and scope of the research. For example, exploring socially constructed knowledge could benefit from qualitative case studies conducted in professional learning communities, or social network analysis that can provide a visual map and analytical understanding of the structure of teachers' knowledge exchange mechanisms. Measuring holistic teacher knowledge and decision-making in classroom situations could also be usefully done through observations. While some of these methods may be too resource-demanding to be used on large samples in an internationally comparable manner, it could be possible to design a set of complimentary qualitative measures that could be used on a smaller scale to accompany a main study and add to a general understanding of knowledge dynamics in the profession.

To illustrate, case studies could build on a large-scale implementation of the ITEL study, by selecting a small number of schools and teacher education institutions from each nationally-representative sample. Such studies could include classroom observations or be more activity-based. Another option would be to link to ongoing work in the CERI Innovative Pedagogies for Powerful Learning (IPPL) project, which is currently collecting a set of cases. Either method, if aligned with the large-scale study, would connect individual survey results to the organisational context (for teacher candidates/teacher educators, this refers to the teacher education institution level, while for teachers, the school level), and explore how this maps on to the development of teachers' knowledge base.

Sampling synergies and a combination of quantitative and qualitative methodological approaches would also better situate the case studies within their demographic and socioeconomic context, thereby strengthening the representativeness of the conclusions made. Of course, the choice of extending the methodology would bring with it both costs and logical elements that would need to be carefully considered before being decided upon and implemented. It would also be possible roll this out in a multi-stage process, for example, by providing a survey with limited qualitative additions in the first round, and then adding further elements as the development and design of the survey proceeded.

Include (or offer as national options) specific thematic foci of high relevance

Some specific areas of teachers' pedagogical knowledge are a high priority for many OECD countries and economies because of rapid social change (e.g. increasing immigration). Yet relevant items tend to get dropped from the final instrument in favour of those that are applicable to all countries and thus unanimously agreed upon. This is an important mechanism for keeping the size and length of the exercise manageable – teachers' free time is scarce, and the length of the assessment needs to be carefully controlled. But it does mean that some emerging areas, or areas of high concern to a limited number of countries, are not addressed. Future work could thus select thematic priorities, based on existing research and country needs, which give better insight to certain competence domains (including both knowledge and affective-motivational areas). These thematic modules would need to

be carefully designed to complement the core survey and yet not overload the time required to take part in the exercise.

For example, a thematic focus could be teachers' knowledge on educating diverse classrooms. A 2010 OECD report highlighted the lack of empirical evidence on what works in teacher education for diversity both in initial and continuing teacher education, and in professional development as well as classroom practices (OECD, 2010). This is important: teachers' beliefs influence factors such as their perceptions, judgments and behaviours in the classroom (Pajares, 1992). It thus follows that their attitudes towards and beliefs about cultural diversity can have an impact on how they teach students from diverse backgrounds (Hachfeld et al., 2015). In the TALIS study (both in 2009 and 2013), teachers consistently reported a high need for appropriate opportunities to learn about teaching for diversity. Thus, focusing on the pedagogical knowledge base related to teaching diverse classrooms, and how this maps on to the corresponding opportunities to learn in teacher education and professional development could be a priority for future investigation.

Similarly, the role of innovative pedagogies and practice is an important policy concern that could also be addressed in a thematic module. CERI has a long history of work on innovative teaching and learning, through its long-standing Innovative Learning Environments project as well as newer work on Innovative Pedagogies for Powerful Learning (IPPL). These projects have been based on case study approaches, capturing the richness and variety of practice present across the OECD. Such work could be usefully complemented by a module in the TKS Main Study designed to address pedagogical innovation and its connection to general pedagogical knowledge (and/or pedagogical content knowledge if applicable; see recommendation in Chapter 4).

Thematic foci could be part of the quantitative data collection, both through probes on teachers' opportunities to learn and through further development of the knowledge assessment instrument to include items or modules on the specific area. It could also complement qualitative analyses, such as a review of initial teacher training and professional development syllabi, standards and competence frameworks, or case studies looking at what pedagogical knowledge is needed to effectively improve students' academic, social and emotional learning outcomes.

Explore potential for an ITEL-TALIS link to capitalise on the different aspects of motivation and learning opportunities captured in both of the surveys' instruments

Currently, both ITEL and TALIS include instruments to measure teacher self-efficacy. Additionally, TALIS explores job satisfaction in relation to teacher retention, self-efficacy, professional development and collaboration, as well as student outcomes. Linking these two bodies of work would allow the ITEL project to explore teacher motivation in the context of job satisfaction and potential implications for the knowledge dynamics within the teaching profession. Future rounds of TALIS that include components such as teacher stress and wellbeing could also be contextualised in ITEL, and links between wellbeing, stress, motivation and knowledge could be explored.

TALIS includes a component exploring participation in and needs for professional development, as well as the nature of collaboration between teachers. Connecting the ITEL and TALIS instruments would allow deeper insight into how various platforms of teacher learning, including formal professional development, as well as informal and non-formal learning (e.g. through collaboration), are related to teachers' pedagogical knowledge. The advantages of creating this link (and also potentially linking to the PISA teachers' survey) would need to be carefully considered in light of the methodological and resource implications this alignment would require.

In sum

In sum, the ITEL TKS Pilot Study has produced an innovative instrument for assessing general pedagogical knowledge in an internationally comparative way. It has also allowed for reflection on what could usefully be adapted to further strengthen the design of future work. Should countries be interested, there would be scope for further development of both the assessment instruments and the 'opportunities to learn' instruments.

As outlined above, the assessment of general pedagogical knowledge can be developed in a number of ways to take into account the complex and dynamic nature of teacher knowledge. It can also be broadened by the use of multiple methods, including case studies and classroom observations. Network mapping can be conducted to trace the diffusion and construction of collaborative knowledge, and triangulation of different knowledge sources (for example, connecting student-teacher responses to their teacher educators, alignment and linking to other OECD surveys etc.) could allow for more robust validation of self-reported data.

Other elements that could be explored are the phases of teaching, such as the knowledge of new teachers and the role of the induction period. The 'opportunities to learn' instruments can be refined through in-depth analyses of national standards and of the duration, scope, and quality of teaching practicums. The instruments can also be further developed to measure the quality of induction and mentoring programmes in those countries in which they are present.

The ITEL TKS pilot study has provided some excellent food for thought from both a research and a policy perspective. The next steps of this work will be developed in collaboration with countries, in order to best suit their needs and priorities. If successful, the ITEL TKS has the potential to help inform some of the biggest challenges to teaching and learning by addressing the "black box" in teaching: teachers' professionalism and their knowledge base. The road is long, and there is still much work to be done in order to achieve these aims. However, this is an important first step, one in which the ITEL TKS proudly continues the CERI tradition of ground-breaking research and policy work.

ANNEX I. ITEL TEACHER KNOWLEDGE SURVEY 2016 DATA

Chapter 3 Data tables

Table I.3.2. Age distribution of teachers in the ITEL TKS

	< 30 years	30-49 years	>= 50 years	Missing information
Estonia	9	27	33	31
Slovak Republic	4	37	34	24
Hungary	2	44	45	9
Israel	2	36	30	31
Greece	1	54	32	13
International (pooled data)	5	36	34	26

Table I.3.3. Age distribution of teacher candidates in the ITEL TKS

	< 30 years	30-49 years	>= 50 years	Missing information
Estonia	55	24	3	18
Slovak Republic	88	4	0	8
Hungary	58	4	1	36
Israel	31	52	9	8
Greece	33	54	4	8
International (pooled data)	53	28	4	15

Table I.3.4. Gender distribution of teachers in the ITEL TKS

	Female	Male	Missing
Estonia	58	11	31
Slovak Republic	70	7	24
Hungary	79	14	7
Israel	61	8	32
Greece	54	31	15
International (pooled data)	62	12	26

Table I.3.5. Gender distribution of teacher candidates in the ITEL TKS

	Female	Male	Missing
Estonia	75	9	16
Slovak Republic	71	21	8
Hungary	45	22	33
Israel	65	28	7
Greece	71	21	8
International (pooled data)	68	18	14

Chapter 4 Data tables

Table I.4.6 to I.4.10 Pedagogical knowledge of teachers, teacher candidates and teacher educators in the ITEL TKS

	Teachers			Teacher candidates			Teacher educators		
	Instructional process	Learning process	Assessment	Instructional process	Learning process	Assessment	Instructional process	Learning process	Assessment
Estonia	29.2	21.6	38.8	38.8	19.5	32.0	42.5	42.1	52.4
Greece	13.2	37.3	57.7	16.3	18.2	58.1	33.3	38.5	56.5
Hungary	35.0	25.0	47.9	35.0	13.1	47.6	30.0	38.1	66.7
Israel	31.1	11.8	47.5	26.0	18.6	49.3	70.0	25.0	45.5
Slovak Republic	9.1	15.0	27.3	9.2	12.5	21.8	24.1	41.4	46.7

Note: Percentage of respondents who scored at least 60% of the items in the given dimensions correctly.

Table I.4.11 Profile of teacher candidates, teachers and teacher educators per sub-dimension

	Teachers	Teacher candidates	Teacher educators
Evaluation & Diagnosis Procedures	70.1	37.4	63.9
Data Use & Research Literacy	70.4	56.7	48.1
Teaching Methods & Lesson Planning	34.9	29.6	49.0
Classroom Management	42.2	67.3	45.2
Motivational-Affective Dispositions	46.5	43.8	84.2
Learning & Development	6.1	22.2	18.7

Note: Percentage of respondents who scored at least 60% of the items in the given sub-dimensions correctly (pooled data).

Table I.4.12 Knowledge profiles based on type of knowledge, thematic orientation and cognitive demand
(percentage of respondents scoring more than 60% of the items in the given dimension)

	Teachers	Teacher candidates	Teacher educators
Theoretical-scientific	7.7	14.2	15.8
Practice-based	47.8	61.2	58.2
Recall	8.7	8.9	8.1
Understand/Analyse	43.8	41.8	73.0
Core knowledge	24.6	26.1	40.4
Key demand for 21st century teaching	49.8	41.6	64.2

Note: Percentage of respondents who scored at least 60% of the items in the given supplementary dimensions correctly (pooled data).

Chapter 5 Data tables

Table I.5.1. Opportunities to learn pedagogical content in the three main dimensions

	Teachers			Teacher candidates		
	Instructional process	Learning process	Assessment	Instructional process	Learning process	Assessment
Estonia	86.5	75.7	69.1	86.6	83.9	63.6
Slovak Republic	76.5	57.4	51.0	80.9	72.5	52.0
Hungary	73.0	60.2	55.6	74.5	74.7	59.1
Israel	75.2	55.8	56.6	61.9	47.1	39.8
Greece	66.0	55.0	45.1	53.1	48.3	32.3

Note: Average percentage of respondents who report having learnt about topics in each of the given dimensions.

Table I.5.2. Opportunities to learn about teaching diverse classrooms (pooled data)

	Teachers	Teacher candidates
Differentiated instruction	65.8	48.2
Student individual differences	80	75.7
Identification of learning difficulties	50.4	62.3
Identification of giftedness	44.3	46.6
Integration of pupils with special needs	48.7	66.4
Intercultural pedagogy	37.5	54.8
Differences between girls and boys and gender pedagogy	49.4	47.5
Inclusive pedagogies	44.6	49.9

Note: Percentage of respondents who report having learnt about the given topic.

Table I.5.3 Opportunities to learn about teaching diverse classrooms (by country)

	Teachers			Teacher candidates		
	Differentiated instruction	Student individual differences	Identification of giftedness	Differentiated instruction	Student individual differences	Identification of giftedness
Estonia	67.8	90.3	59.7	51.9	94.1	73.1
Slovak Republic	63.4	68.5	29.3	56.3	72.4	33.3
Hungary	75.6	85.9	60.0	66.7	96.6	76.7
Israel	72.4	79.5	24.6	36.0	57.0	16.0
Greece	39.4	59.2	35.2	35.6	44.1	19.0

Note: Percentage of respondents who report having learnt about the given topic.

Table I.5.4 Opportunities to learn 21st century pedagogies versus educational and learning theories (pooled data)

	Teachers	Teacher candidates
Project work	66.5	53.3
Gamification	66.0	68.5
Use of ICT in class	86.8	84.4
Use of media and resources for teaching	84.1	83.9
Interactive activities	68.4	71.1
Different teacher roles	80.5	84.8
Performance appraisal other than school grades	78.9	78.0
Psychological theories of child development	84.4	88.3
Educational theories of learning	81.3	90.9

Note: Percentage of respondents who report having learnt about the given topic.

Table I.5.5 Opportunities to learn 21st century pedagogies versus educational and learning theories (by country)

	Teachers				Teacher candidates			
	Project work	Gamification	Use of ICT in class	Use of media and various resources for teaching	Project work	Gamification	Use of ICT in class	Use of media and various resources for teaching
Estonia	71.5	85	95.2	93.2	54.3	87	97.3	94.1
Slovak Republic	69.9	86	83.9	78.5	69	85.1	74.7	87.4
Hungary	61.6	41.9	69.8	80.2	58.6	50	93.3	80
Israel	63.3	52	84	82	46.5	49.5	84	78.6
Greece	59.2	38.6	91.5	73.2	35.6	27.1	54.2	57.6

Note: Percentage of respondents who report having learnt about the given topic.

Table I.5.6. Quality of opportunities to learn in initial teacher education and professional development

	Teachers				Teacher candidates			
	Participants worked in teams.	Any suggestions and ideas from participants were welcome.	Participants were involved in the design or organisation of the seminar/lecture.	Participants were able to influence the selection of topics.	Participants worked in teams.	Any suggestions and ideas from participants were welcome.	Participants were involved in the design or organisation of the seminar/lecture.	Participants were able to influence the selection of topics.
International (pooled data)	55.1	61.6	43.3	32.7	57.8	60.1	40.4	27.4
Estonia	60.6	66	43.1	37.1	71.6	70.1	44	30.2
Slovak Republic	58.8	62.7	46.4	33.7	53.6	58.6	46.7	33.7
Hungary	34.1	39	34.5	20.2	50.6	51.7	33.3	36.8
Israel	61.1	69.1	45.4	32.8	55.7	50.3	36.4	18.3
Greece	48.1	60.7	47	33.9	28.2	52	30.5	19.8

Note: Weighted average of the percentage of respondents who report that the given characteristics applied to their courses (weights: 0 – doesn't apply, 1 - partially applies, 2 - mostly applies, 3 - fully applies).

Table I.5.7. Opportunities to learn: Methods used by teacher educators at lectures and seminars

	Presenting content to the whole class /Lectures	Presenting content to the whole class /Seminars	Assigning students work in pairs or small groups /Lectures	Assigning students work in pairs or small groups /Seminars	Assigning students work individually /Lectures	Assigning students work individually /Seminars	Assigning project work/Lectures	Assigning project work/Seminars
Estonia	70.4	68.3	80.1	90.3	62.2	70.5	31.4	40.9
Slovak Republic	86.8	68.4	40.9	86.4	51.3	83.6	28.0	52.4
Hungary	88.9	57.7	36.5	73.1	43.9	84.0	22.7	49.4
Israel	84.0	82.5	76.0	60.3	62.7	76.7	38.7	42.9
Greece	77.1	70.4	61.9	78.6	49.4	64.1	28.7	39.5

Note: Weighted average of the percentage of respondents who report that they use the given method in their courses (weights: 0 – never, 1- rarely (about once per course), 2 – sometimes (about 4-6 times in a course), 3 - often (at least weekly)).

Table I.5.8. Engagement with and in research

	Engagement with Research						Engagement in Research					
	Reading research papers in the domain of learning sciences	Reading research papers in the domain of educational sciences	Evaluating research findings in terms of validity and reliability	Analysing and interpreting research findings in terms of implementation in practice	Analysing and interpreting national or international student data	AVERAGE	Conducting a research or literature review?	Collecting and analysing qualitative data	Collecting and analysing quantitative data	Conducting action research in a classroom or school context	Implementing the findings of your action research to change your practice	AVERAGE
Teachers												
Estonia	67.1	70.5	44.9	50.7	36.9	54.0	47.3	35.7	35.0	41.3	45.4	40.9
Slovak Republic	39.6	36.3	29.7	44.4	50.5	40.1	17.6	34.4	58.2	31.1	34.4	35.2
Hungary	82.1	85.7	32.1	31.0	39.3	54.0	47.6	24.1	27.4	15.5	18.1	26.5
Israel	60.3	50.4	46.0	61.3	52.8	54.2	51.2	42.5	40.2	45.2	49.6	45.7
Greece	55.9	73.9	55.1	69.1	44.1	59.6	78.3	50.0	47.8	53.6	73.9	60.7
Teacher candidates												
Estonia	78.0	72.5	36.5	44.5	31.9	52.7	68.7	42.5	26.5	19.1	14.9	34.4
Slovak Republic	42.5	45.3	25.9	40.2	31.4	37.1	62.1	41.9	65.5	26.4	19.8	43.1
Hungary	72.4	75.9	34.5	34.5	51.7	53.8	58.6	27.6	27.6	17.2	17.9	29.8
Israel	86.2	89.4	52.6	61.1	34.0	64.7	80.0	69.5	43.2	53.7	44.2	58.1
Greece	61.0	74.6	34.5	54.2	35.6	52.0	57.6	32.2	30.5	28.8	37.3	37.3
Teacher educators												
Estonia	82.9	85.3	85.3	84.1	38.8	75.3	81.2	78.3	74.3	40.6	51.4	65.1
Slovak Republic	62.3	67.1	51.3	68.8	44.2	58.7	71.8	67.5	67.9	44.7	59.0	62.2
Hungary	73.1	69.2	44.0	69.2	65.4	64.2	80.8	69.2	53.8	50.0	42.3	59.2
Israel	82.8	93.1	55.2	82.8	41.4	71.0	93.1	79.3	58.6	55.2	50.0	67.2
Greece	61.8	80.6	51.4	72.2	42.4	61.7	86.1	63.9	54.3	71.4	75.0	70.1

Note: Average percentage of respondents who report engaging with/in the given activities.

Table I.5.9. Pedagogical knowledge items that show a relationship with corresponding opportunities to learn

	Teachers			Teacher candidates		
	Instructional Process	Learning Process	Assessment	Instructional Process	Learning Process	Assessment
Estonia	56%	21%	35%	50%	54%	44%
Slovak Republic	56%	57%	53%	38%	85%	72%
Hungary	63%	50%	59%	31%	8%	50%
Israel	25%	57%	41%	63%	38%	67%
Greece	50%	43%	35%	38%	46%	67%

Note: Percentage of pedagogical knowledge items that can be predicted by the corresponding opportunities to learn items with an odds ratio larger than 1 per country for each main dimension.

Table I.5.10. Relationship between professional collaboration and engagement in and with research

	Teachers		Teacher candidates	
	Engagement in Research	Engagement with Research	Engagement in Research	Engagement with Research
Professional collaboration and Research activities	**Correlation coefficient**	**Correlation coefficient**	**Correlation coefficient**	**Correlation coefficient**
Estonia	0.38***	0.39***	0.19**	0.37***
Slovak Republic	0.38***	0.33**	0.20	0.33**
Hungary	0.27*	0.13	0.30	0.30
Israel	0.32***	0.35***	0.19	0.30*
Greece	0.22	0.29**	0.29	0.41*

Note: ***: p<0.001; **: p<0.01; *: p<0.05

Table I.5.11. Relationship between professional collaboration and engagement in and with research

Student agency and interest in professional development	Teachers
	Correlation coefficient
Estonia	0.27***
Slovak Republic	0.13
Hungary	0.17
Israel	0.16
Greece	0.30*

Note: ***: p<0.001; **: p<0.01; *: p<0.05

Chapter 6 Data tables

Table I.6.1. Self-efficacy in instructional strategies and classroom management

	Teachers		Teacher candidates	
	Instructional Strategies	Classroom Management	Instructional Strategies	Classroom Management
International (pooled data)	63.6	58.4	47.5	46.1
Estonia	45.4	49.0	34.7	48.4
Slovak Republic	64.8	56.5	42.9	43.2
Hungary	80.4	75.9	54.0	49.2
Israel	75.1	69.4	65.8	46.8
Greece	73.7	47.1	58.3	40.2

Note: Combined percentage of respondents who answered 6 & 7 on the Likert Scale

Table I.6.2 Instructional quality: Frequency of various assessment practices

Teachers				
	In all or nearly all lessons	Frequently	Occasionally	Never or almost never
I observe students when working on particular tasks and provide immediate feedback	34.2	50.6	14.1	1.1
I provide written feedback on student work in addition to a numeric score or letter grade	21.8	47.2	26.9	4.1
I develop and administer my own assessment	16.9	50.2	30.2	2.7
I have individual students answer questions in front of the class	14.0	29.8	38.6	17.5
I let students evaluate their own progress	7.6	36.4	47.1	8.9
I administer a standardised test	6.4	33.2	44.2	16.3

Table I.6.3. Self-efficacy in student engagement

	Teachers				Teacher candidates			
	How much can you do to motivate students who show low interest in school work?	How much can you do to get students to believe they can do well in school work?	How much can you do to help your students' value learning?	How much can you assist families in helping their children do well in school?	How much can you do to motivate students who show low interest in school work?	How much can you do to get students to believe they can do well in school work?	How much can you do to help your students' value learning?	How much can you assist families in helping their children do well in school?
International (pooled data)	28.7	46.9	43.5	17.3	44.9	62.4	49.7	21.8
Estonia	9.6	33.2	30.0	8.0	45.3	59.8	51.0	16.2
Slovak Republic	24.0	35.0	28.3	16.2	31.1	43.3	28.9	18.9
Hungary	13.0	42.4	54.3	31.5	9.7	45.2	43.3	6.5
Israel	56.3	80.3	65.5	25.4	60.9	83.5	57.9	33.0
Greece	40.5	45.6	48.1	13.9	51.6	68.3	63.5	30.2

Note: Combined percentage of respondents who answered 6 and 7 on the Likert Scale

Table I.6.4. Self-responsibility in quality of teaching and relationships with students

	Teachers		Teacher candidates	
	Quality of teaching	Relationships with students	Quality of teaching	Relationships with students
Estonia	57.8	60.8	68.7	70.4
Slovak Republic	60.9	58.7	58.8	72.1
Hungary	74.1	76.4	67.7	89.2
Israel	68.3	69.3	70.4	79.8
Greece	65.8	77.2	70.3	80.5

Note: Combined percentage of respondents who answered 6 & 7 on the Likert Scale

Table I.6.5. Teacher responses to "I would feel personally responsible if a student of mine had very low achievement"

	Likert Scale Responses						
	1	**2**	**3**	**4**	**5**	**6**	**7**
International (pooled data)	2.2	7.9	15.1	33.9	23.8	14.3	2.8
Estonia	1.3	7.6	12.5	39.3	24.6	14.3	0.5
Slovak Republic	6.1	10.2	21.4	36.7	15.3	8.2	2
Hungary	2.2	7.6	9.8	31.5	29.4	15.2	4.4
Israel	1.4	6.3	14	25.2	26.6	21	5.6
Greece	1.3	9	23.1	33.3	20.5	9	3.9

Table I.6.6. Intrinsic and Extrinsic motivations for teaching

	Teachers		Teacher candidates	
	Intrinsic	Extrinsic	Intrinsic	Extrinsic
International (pooled data)	83.2	33.9	77.6	30.0
Estonia	76.0	36.8	75.0	44.1
Slovak Republic	77.5	26.0	65.2	18.6
Hungary	94.6	25.7	93.4	26.9
Israel	89.0	43.0	83.6	18.5
Greece	86.6	28.4	84.7	23.8

Note: Combined percentage of respondents who answered 6 & 7 on the Likert Scale

Table I.6.7. Ability as a motivation for teaching

	Teachers	Teacher Candidates
International (pooled data)	66.8	54.5
Estonia	53.0	45.2
Slovak Republic	64.9	50.0
Hungary	81.4	58.1
Israel	80.5	67.0
Greece	66.7	66.0

Note: Combined percentage of respondents who answered 6 & 7 on the Likert Scale

Table I.6.8. Social career value as a motivation for teaching

	Teaching (will allow) allows me to influence the next generation.	Teaching (will allow) allows me to raise the ambitions of underprivileged youth.	Teaching (will allow) allows me to provide a service to society.	Teachers make a worthwhile social contribution.
International (pooled data)	61.2	42.2	62.8	67.5
Estonia	47.1	27.2	54.5	57.8
Slovak Republic	64.3	50.5	56.1	68.4
Hungary	69.6	50.0	60.4	63.0
Israel	74.5	46.1	76.4	80.1
Greece	63.6	58.2	73.4	75.9

Note: Combined percentage of respondents who answered 6 & 7 on the Likert Scale

Table I.6.9. Enthusiasm

	Teachers		Teacher candidates	
	I really enjoy teaching	I teach with great enthusiasm	I really enjoy teaching	I teach with great enthusiasm
International (pooled data)	69.2	62.7	63.4	64.2
Estonia	60.8	59.8	52.2	55.6
Slovak Republic	90.2	85.9	74.2	77.4
Hungary	80.3	85.2	64.2	71.6
Israel	82.9	88.2	88.3	85.0
Greece	69.2	62.7	63.4	64.2

Note: Combined percentage of respondents who answered 6 & 7 on the Likert Scale

Table I.6.10. Planned persistence in teachers versus teacher candidates

	Teachers		Teacher candidates	
	How sure are you that you will persist in a teaching career?	How satisfied are you with your choice of being a teacher?	How sure are you that you will persist in a teaching career?	How satisfied are you with your choice of being a teacher?
International (pooled data)	69.3	70.9	42.6	54.5
Estonia	57.1	66.8	44.6	53.8
Slovak Republic	59.2	55.7	28.1	43.8
Hungary	79.3	78.3	51.6	51.6
Israel	83.0	78.0	42.9	58.9
Greece	80.3	80.3	52.5	65.6

Note: Combined percentage of respondents who answered 6 & 7 on the Likert Scale

Table I.6.11. Willingness to invest personal time across the pooled sample

On a scale of 1 (None) to 7 (Most of it), how much of your PERSONAL time are you willing to invest…	Teachers	Teacher Candidates
To work with students	41.4	40.9
To improve your teaching	53.2	54.8
To help students	47.6	51.2
To communicate with parents	22.4	24.7
To prepare good lessons	57.5	60.2

Note: Combined percentage of respondents who answered 6 & 7 on the Likert Scale

Table I.6.12. Interest in professional development in teachers and teacher candidates

	Teachers				Teacher candidates			
	Subject-specific knowledge	Pedagogical knowledge	Classroom management skills	Alternative teaching practices	Subject-specific knowledge	Pedagogical knowledge	Classroom management skills	Alternative teaching practices
Estonia	71.4	55.4	57.4	55.4	72.7	68.6	68.9	63.9
Slovak Republic	64.3	60.4	46.4	61.9	56.7	54.4	43.1	62.9
Hungary	81.5	76.1	73.6	72.8	51.6	64.5	61.3	58.1
Israel	79.7	67.8	59.4	64.1	79.5	70.3	74.1	74.1
Greece	79.5	75.6	79.5	88.3	80.6	83.9	79.0	82.0

Note: Combined percentage of respondents who answered 6 & 7 on the Likert Scale

Correlation tables for Chapter 6

Table I.6.13. Relationships between self-efficacy in instructional strategies and use of assessment

Teachers	Self-efficacy in instructional strategies
Instructional Quality, Use of Assessment	Correlation coefficient
Greece	0.28*
Estonia	0.33***
Israel	0.26**
Hungary	0.31**
Slovak Republic	0.33**

Note: ***: p<0.001; **: p<0.01; *: p<0.05

Table I.6.14. Relationships between self-efficacy subscales and scope of field experience, teacher candidates

Teacher candidates	Self-efficacy in classroom management	Self-efficacy in instructional strategies
Field experience, scope of experience	Correlation coefficient	Correlation coefficient
Estonia	-0.02	0.08
Slovak Republic	0.42***	0.30**
Hungary	0.05	0.17
Israel	0.14*	0.18*
Greece	0.41**	0.32*

Note: ***: p<0.001; **: p<0.01; *: p<0.05

Table I.6.15. Relationship between self-efficacy and professional collaboration

Teachers	Self-efficacy in student engagement
OTL, Professional collaboration	Correlation coefficient
Estonia	0.26***
Slovak Republic	0.30**
Hungary	0.30**
Israel	0.13
Greece	0.25*

Note: ***: p<0.001; **: p<0.01; *: p<0.05

Table I.6.16. Relationship between self-responsibility and self-efficacy

	Self-responsibility for student achievement	
Self-efficacy in student learning	Correlation coefficient, teachers	Correlation coefficient, teacher candidates
Estonia	0.38***	0.14*
Slovak Republic	0.25*	0.15
Hungary	0.08	-0.09
Israel	0.47***	0.39***
Greece	0.51***	0.43***

Note: ***: p<0.001; **: p<0.01; *: p<0.05

Table I.6.17. Relationship between social goals of teachers and social support for students

Teachers	Social Goals of Teachers
Instructional Quality, Social Support for Students	Correlation coefficient
Estonia	0.39***
Slovak Republic	0.33***
Hungary	0.34**
Israel	0.19*
Greece	0.01

Note: ***: p<0.001; **: p<0.01; *: p<0.05

Table I.6.18. Relationship between enthusiasm and self-efficacy in student engagement

	Enthusiasm	
Self-efficacy in student engagement	Correlation coefficient, Teachers	Correlation coefficient, Teacher candidates
Estonia	0.37***	0.39***
Slovak Republic	0.37***	0.34***
Hungary	0.44***	0.31*
Israel	0.31***	0.48***
Greece	0.26*	0.41**

Note: ***: p<0.001; **: p<0.01; *: p<0.05

Table I.6.19. Relationships between planned persistence and intrinsic motivation and self-efficacy

	Commitment to teaching, Planned persistence		
	Intrinsic motivation		Teacher self-efficacy, student engagement
	Teachers	Teacher candidates	Teachers
Estonia	0.48***	0.48***	0.28***
Slovak Republic	0.31**	0.65***	0.30**
Hungary	0.21*	0.33**	0.15*
Israel	0.47***	0.41***	0.12*
Greece	0.35**	0.38**	0.25*

Note: ***: p<0.001; **: p<0.01; *: p<0.05

Table I.6.20. Relationship between self-efficacy in student engagement and willingness to invest personal time

	Self-efficacy in student engagement: assist families in helping children do well in school	
Willingness to invest personal time communicating with parents	Correlation coefficient, teachers	Correlation coefficient, teacher candidates
Estonia	0.47***	0.22**
Slovak Republic	0.33**	0.37***
Hungary	0.24*	0.14
Israel	0.43***	0.35***
Greece	0.31**	0.14

Note: ***: p<0.001; **: p<0.01; *: p<0.05

ANNEX II. DESCRIPTION OF CONSTRUCTS AND SCALES

Opportunities to learn

Table II.5.1 Opportunities to learn the main knowledge dimensions: Instructional process; Learning process; Assessment

Pedagogical content dimension	Item	Teaching diverse classrooms / 21st century teaching scales
Teacher candidates: Have you learned about the following pedagogical topics during your initial teacher education studies? *Teachers*: Have you learned about the following pedagogical topics during any of your studies (whether during initial teacher education or professional development)? *Both:* Examples in brackets are indicative. Mark "Yes" if you have learned about the given topic even if you haven't covered all the examples listed.		
Instructional process	a) Lesson design (e.g. planning and structuring activities)	
	b) Lesson objectives and goals (e.g. learning outcomes, aligning design to goals)	
	c) Time management in the classroom (e.g. optimising instructional time, prioritising, adapting the plan during the lesson)	
	d) Curriculum (e.g. the concept, purposes, national curriculum vs. school and subject curriculum, aligning curricula)	
	e) Forms of working in the classroom (e.g. assigning and managing individual, pair, group and whole class work)	
	f) Long-term planning (e.g. weekly, thematic unit planning, syllabuses)	
	g) Project work and other types of student assignments that require more than one week to complete or for students to work in groups	21st century teaching scales
	h) Differentiated instruction (e.g. individual assistance, internal differentiation, personalized instruction)	Teaching diverse classrooms
	i) Types of classroom discourse/dialogue (e.g. initiating, managing, promoting discourse/dialogue)	
	j) Peer review and peer support (e.g. students helping students)	
	k) Gamification (e.g. application of game-design elements and game principles in teaching)	21st century teaching scales
	m) Use of ICT in class (e.g. internet and software tools for pedagogical purposes)	21st century teaching scales
	n) Phases and structure of the lesson (e.g. introduction, warming, closing, etc.)	
	o) Use of media and various resources for teaching (e.g. videos, visuals, or objects and materials from everyday life)	21st century teaching scales
	ac) Classroom management (concepts and components)	
	ad) Classroom climate (e.g. physical and social environment of the classroom)	
	af) Various forms of interactive activities for involving and engaging students in classroom discussions	21st century teaching scales
	ag) Ground rules for the class or 'code of conduct'	
	ah) Disciplinary problems and how to address classroom disruptions	

	ak) Different teacher roles (e.g. information provider, facilitator, mediator, planner)	21st century teaching scales
Learning process	l) Educational theories of learning (e.g. constructivism, behaviourism, social-constructivism)	
	r) Student individual differences (e.g. prior knowledge, motivation, ability levels)	Teaching diverse classrooms
	ae) Students' social and emotional development (e.g. emotion regulation, self-esteem, self-efficacy, respect for others, communicating and interacting with others)	
	ai) Forms of student motivation (e.g. perseverance, self-direction, goal-orientation, etc.)	
	aj) Psychological theories of child development (e.g. Piaget, Maslow, Bronfenbrenner, Montessori, Vygotsky, Erikson, Kohlberg, etc.)	
	am) Identifying and intervening when students display emotional problems (e.g. stress, anxiety, traumatic event, family dysfunction, victimization)	
	an) Identifying and intervening when students display behavioural problems (e.g. aggression, hyperactivity, misconduct)	
	ao) Integration of pupils with special needs	Teaching diverse classrooms
	ap) Intercultural pedagogy and differences between pupils from different nationalities, cultures, and social background	Teaching diverse classrooms
	aq) Differences between girls and boys and gender pedagogy	Teaching diverse classrooms
	ar) Methods and interventions for inclusion and inclusive pedagogies, including methods for preventing and dealing with discrimination and bullying based on gender, sexual orientation, cultural background, etc.	Teaching diverse classrooms
	at) Science of learning (e.g. cognitive processes underlying learning, such as memory, executive functions, attention controls, how information is acquired, stored, recalled, etc.)	
Assessment	p) Reflecting on and analysing own teaching	
	q) Using videos to analyse teaching (e.g. one's own teaching recorded on video, other teachers' teaching recorded on video, etc.)	
	s) Forms of performance assessment (e.g. paper-and-pencil, computer-based tests, oral tests, multiple-choice, open-answer, etc.)	21st century teaching scales
	t) Pedagogical diagnostic methods (e.g. identifying causes of success or gaps in student learning via test results, homework, lesson activities, etc.)	
	u) Career guidance for students	
	v) Guiding parents in how they can reinforce classroom learning to help their children learn	
	w) Identification of learning difficulties of students and interpretation of specialists' diagnosis (e.g. dyslexia, dysgraphia, attentional problems, etc.)	Teaching diverse classrooms
	x) Standardised tests (e.g. national and international tests)	
	y) School grades (e.g. uses and functions, advantages, disadvantages)	
	z) Identification of giftedness	Teaching diverse classrooms
	aa) Reference norms for assessment (e.g. social, individual, criterion-referenced)	
	ab) Types of performance appraisal other than school grades (e.g. formative and summative evaluation, written or oral feedback, student portfolio, etc.)	

	al) Reading educational research findings	
	as) Grade retention (e.g. practices, advantages, disadvantages)	

Table II.5.2 Quality of opportunities to learn: Quality of Instruction; Demands; Student Agency

Scales	Items
Teacher candidates: Considering all your teacher education courses, to what extent do the following statements apply to the quality of the teaching? *Teachers*: Considering all your formal professional development courses within the last 12 months, to what extent do the following statements apply to the quality of the teaching? [1) Does not apply at all / 2) Partially applies / 3) Mostly applies / 4) Fully applies]	
Quality of instruction	a) Knowledge was presented in a well-structured way.
	b) Students were provided with a good overview of the pedagogical content to be covered.
	c) The content was clearly presented.
	d) Students dealt with pedagogical issues in an intellectually challenging way.
	e) Students worked in teams (team work was an important form of class work).
	f) Students contributed actively to plenary discussions.
	g) Students showed interest in the learning content.
Demands	h) The demands were too high.
	i) It was difficult to catch up if you had been absent one session.
	j) It was intellectually very challenging to satisfy the requirements.
	k) Preparation for lessons and follow-up work was time consuming.
Student agency	l) Any suggestions and ideas from students were welcome.
	m) Students were involved in the design or organisation of the seminar/lecture (e.g. to conduct project work, individually, or in groups).
	n) Students were able to influence the selection of topics.

Table II.5.3 Research activities: Engagement in research, and with research

Scales	Items
Teacher candidates: During your initial teacher education, were you engaged in the following activities? [Yes / No] *Teachers*: During any of your formal or informal professional development activities, were you engaged in the following? [Yes / No] *Teacher educators*: Are you engaged in the following activities in your work as a teacher educator? [Yes / No]	
Engagement with research	(a) Reading research papers in the domain of learning sciences (e.g. developmental psychology, educational neurosciences, cognitive science)?
	(b) Reading research papers in the domain of educational sciences (e.g. educational sociology, history, philosophy)?
	(c) Evaluating research findings in terms of validity and reliability?
	(d) Analysing and interpreting research findings in terms of implementation in practice?
	(e) Analysing and interpreting national or international student data (e.g. student performance on standardized assessments)?
Engagement in research	(f) Conducting a research or literature review?
	(g) Collecting and analysing qualitative data (e.g. conducting focus groups, interviews, thematic coding, etc.)?
	(h) Collecting and analysing quantitative data (e.g., conducting quasi-experiments, randomised control trials, surveys, statistical analyses)?
	(i) Conducting action research in a classroom or school context (e.g. experimenting with

	specific pedagogical interventions and measuring their impact)?
	(j) Implementing the findings of your action research to change your practice?

Table II.5.4. Professional collaboration

Scale	Teachers	Teacher candidates	Teacher educators
Professional collaboration	How often do you engage in professional collaboration with the following actors for the purpose of improving teaching and student learning? [Never / Rarely (about once a year) / Sometimes (about 4-6 times a year) / Often (at least monthly)]		
	(a) My teacher colleagues	a) My fellow students	(a) My teacher educator colleagues
	(b) Teachers of other schools	b) Students of other institutions	(b) Teacher educators of other institutions
	(c) Teacher trainers or educators	c) Teachers	(c) Teachers
	(d) Researchers or academics of educational sciences (e.g. educational sociology, history of education, philosophy of education, etc.)	d) Researchers or academics of educational sciences (e.g. educational sociology, history of education, philosophy of education, etc.)	(d) Researchers or academics of educational sciences (e.g. educational sociology, history of education, philosophy of education, etc.)
	(e) Researchers or academics of learning sciences (e.g., developmental psychology, cognitive science, educational neurosciences)	e) Researchers or academics of learning sciences (e.g. developmental psychology, cognitive science, educational neurosciences)	(e) Researchers or academics of learning sciences (e.g., developmental psychology, cognitive science, educational neurosciences)
	(f) Researchers or academics of other disciplines	f) Researchers or academics of other disciplines	(f) Researchers or academics of other disciplines
	(g) Policy-makers at local, regional or national level	g) Policy-makers at local, regional or national level	(g) Policy-makers at local, regional or national level
	(h) Professionals from related sectors (e.g. social or youth workers, educators of students with special education needs, mental health professionals, etc.)	h) Professionals from related sectors (e.g. social or youth workers, educators of students with special education needs, mental health professionals, etc.)	(h) Professionals from related sectors (e.g. social or youth workers, educators of students with special education needs, mental health professionals, etc.)

Table II.5.5. Field experience: Quantity of Experiences; Scope of Experiences; Professional Support

Scales	Items
Quantity of Experiences	During your school teaching practicum, did you have the opportunity to…
	a) ...observe lessons? [Yes/No]
	(a1) If yes, how many lessons? [1-10 lessons / 11-20 lessons/ 21-30 lessons/ 51-100 lessons/ More than 100 lessons]
	b) ...assist a teacher in the classroom (e.g. personal support of a pupil, support of group work)? [Yes/No]
	(b1) If yes, how many lessons? [1-10 lessons / 11-20 lessons/ 21-30 lessons/ 51-100 lessons/ More than 100 lessons]
	c) ...give a lesson by yourself, while in the presence of a teacher? [Yes/No]
	(c1) If yes, how many lessons? [1-10 lessons / 11-20 lessons/ 21-30 lessons/ 51-100 lessons/ More than 100 lessons]
	d) ...give a lesson by yourself, without the presence of a teacher? [Yes/No]
	(d1) If yes, how many lessons? [1-10 lessons / 11-20 lessons/ 21-30 lessons/ 51-100 lessons/ More than 100 lessons]
Scope of Experiences	How often were the following activities assigned as part of your teaching practicum? [Not at all / Rarely / Sometimes / Often]
	a) Plan lessons
	b) Teach individual lessons to whole classes

	c) Tutor individual pupils
	d) Work with small groups of pupils
	e) Assist teachers in other ways
	f) Assist in school activities outside assigned classroom (e.g. sports, field trips)
	g) Carry out case studies of selected pupils
	h) Carry out classroom observation
	i) Collect data for research projects
	j) Visit families in their homes
	k) Interview teachers and/or principals
	l) Observe and/or participate in teachers' meetings
Professional Support - Quantity	During the teaching practicum, how often do you expect to be observed by a teacher educator or supervisor? [(a) Every day that the pre-service teacher spends in school b) Not every day, but at least once a week c) Every 2-3 weeks d) Once a month or less frequently e) Once every 4 months f) Never]
Professional Support - Scope	During your school teaching practicum, have you had a chance to experience any of the following issues? A teacher… [Yes/No]
	(a) …shared with me his/her observations of my lessons?
	(b) …asked me questions about my class, which encouraged me to reflect (about my class)?
	(c) …made my achievements more visible and praised my strengths?
	(d) …gave me suggestions for improvement?
Professional Support - Breadth	During your school teaching practicum, did you have the opportunity to…
	e) ...work together with a mentor to support, reflect on, or improve your teaching?
	f) …learn about the school as an organisation?
	g) …learn about the work of teachers?

Table II.5.6. Performance Evaluation of teacher educators

Scale	Items
Performance evaluation	Indicate how important the following factors are in your performance evaluation. [Very important / Moderately important / Slightly important / Not important]
	(a) Knowledge of the subject you teach
	(b) Your teaching competencies (e.g. methods of instruction, forms of assessment)
	(c) Your students' performance
	(d) Your research activities (e.g. number and quality of publications)
	(e) Collaboration within the institution (e.g. inter-disciplinary research projects)
	(f) Collaboration outside the institution (e.g. national and international research projects)

Table II.5.7. Teaching Practices of teacher educators

Scales	Items
Teaching Methods	How often do you use the following teaching methods in your lectures and seminars? "Lectures" are defined as courses aiming primarily at transferring knowledge; usually delivered at large groups of students. "Seminars" are defined as courses aiming primarily at engaging students in reflection, analysis, individual or group work; usually delivered to smaller groups of students. [Never / Rarely (about once per course) / Sometimes (about 4-6 times in a course) / Often (at least weekly)]
	(a) Presenting content to the whole class
	(b) Assigning students work in pairs or small groups

	(c) Assigning students to work individually
	(d) Assigning project work (e.g., long-term complex projects undertaken by a group of students)
Student Agency	How often do you use the following teaching methods in your lectures and seminars? "Lectures" are defined as courses aiming primarily at transferring knowledge; usually delivered at large groups of students. "Seminars" are defined as courses aiming primarily at engaging students in reflection, analysis, individual or group work; usually delivered to smaller groups of students. [Never / Rarely (about once per course) / Sometimes (about 4-6 times in a course) / Often (at least weekly)]
	(a) Do you involve your students in planning the content of your classes?
	(b) Do you involve your students in the design or organisation of your classes?

Quality of teaching practice

Table II.6.1. Quality of teaching practice

Scale	Sub-scale	Item	Directions to respondent
Instructional Quality	Monitoring	As a rule, I soon notice if students get distracted, and I put a stop to it at once.	On a scale from 1 (Strongly disagree) to 4 (Strongly agree), how strongly do you agree or disagree with the following statements about the classes you teach?
		I notice immediately if one or more students aren't concentrating; I then involve them in the lesson immediately.	
	Cognitive autonomy support for students	I work on the basis of the students' ideas and carry on with that working until the students see whether their approach will lead to the goal or whether incongruities are becoming apparent.	
		If a student makes a mistake when a new topic is being covered, I initially accept the suggestion without comment, and carry on working through the problem with the students until the mistake becomes obvious.	
		I sometimes deliberately let the students go astray until they realize that something must be wrong.	
		I work on the basis of the students' suggestions and carry on with that working until the students notice that something doesn't add up.	
		If a student makes a mistake when a new topic is being covered, I ask the class for their opinion without commenting myself.	
	Social support for students	I take care of my students if they have problems.	
		I build up trusting relationships with my students.	
		I show understanding for my students.	
		I take time to listen if my students want to discuss something with me.	
	Use of assessment	I develop and administer my own assessment.	"On a scale from 1 (Never or almost never) to 4 (In all or nearly all lessons), how often do you use the following methods of assessing student learning in the classes you teach? (1) Never or almost never, (2) Occasionally, (3) Frequently, (4) In all or
		I administer a standardized test.	
		I have individual students answer questions in front of the class.	
		I provide written feedback on student work in addition to a numeric score or letter grade.	
		I let students evaluate their own progress.	
		I observe students when working on particular tasks and provide immediate feedback.	

			nearly all lessons”
Classroom Management	Dealing with disruptions	When the lesson begins, I have to wait quite a long time for students to quiet down.	On a scale from 1 (Strongly disagree) to 4 (Strongly agree), How strongly do you agree or disagree with the following statements about the classes you teach? (*Reverse coded)
		Students in this class take care to create a pleasant learning atmosphere.	
		I lose quite a lot of time because of students interrupting the lesson.	
		There is much disruptive noise in this classroom.	
	Teacher with-it-ness	I know exactly what happens in the classroom..	"On a scale from 1 to 4, to what degree are the following statements true or false of your teaching: (1) Not at all true of me/my classes, (2) Mostly not true of me/my classes, (3) Mostly true of me/my classes, (4) Completely true of me/my classes "
		I check that my students are paying attention.	
		I know exactly who does not work.	
		I know when students are not on task any more.	
	Clarity of rules	I make explicit the rules for classroom behaviour.	
		I make explicit what will happen when the rules for classroom behaviour are broken.	
		I make explicit what students are allowed to do and what they are not allowed to do in a lesson.	
	Differentiation	I assign individual students different tasks.	
		I allow faster students to go ahead to the next task.	
		I vary the difficulty of questions depending on students' abilities.	
		I put higher demands on higher-ability students.	

Teacher motivation

Table II.6.2. Teacher Self-efficacy scale

Sub-scale	Item	Directions to respondent
Efficacy in student engagement	How much can you do to motivate students who show low interest in school work?	Please indicate your opinion about each of the statements below. On a scale of 1 (Nothing at all) to 7 (A great deal), how much can you do?
	How much can you do to get students to believe they can do well in school work?	
	How much can you do to help your students' value learning?	
	How much can you assist families in helping their children do well in school?	
Efficacy in instructional strategies	To what extent can you craft good questions for your students?	
	How much can you use a variety of assessment strategies?	
	To what extent can you provide an alternative explanation or example when students are confused?	
	How well can you implement alternative strategies in your classroom?	
Efficacy in classroom	How much can you do to control disruptive behaviour in the classroom?	

management	How much can you do to get children to follow classroom rules?	
	How much can you do to calm a student who is disruptive or noisy?	
	How well can you establish a classroom management system with each group of students?	
Efficacy in student achievement	...I can get any of my students to make excellent progress throughout the school year.	On a scale of 1 (Not at all confident) to 7 (Completely confident), how confident are you that you can accomplish each of the following if you try? I am confident that…
	...I can get any of my students to learn the required material.	
	...I can prevent any of my students from having very low achievement.	

Table II.6.3. Motivations for teaching scale

Sub-scale	Item	Directions to respondent
Ability	I have the qualities of a good teacher.	On a scale of 1 (Not at all important) to 7 (Extremely important), how important are the following reasons for your choice to be a teacher?* *Teachers: I am a teacher because… *Teacher candidates: I want to become a teacher because…
	I have good teaching skills.	
	Teaching is a career suited to my abilities.	
Intrinsic career value	I am interested in teaching.	
	I like teaching.	
Extrinsic career value	Teaching (will provide) provides a reliable income.	
	Teaching (will be) is a secure job.	
	Teaching (will offer) offers a steady career path.	
Social career value	Teaching (will allow) allows me to influence the next generation.	
	Teaching (will allow) allows me to raise the ambitions of underprivileged youth.	
	Teaching (will allow) allows me to provide a service to society.	
	Teachers make a worthwhile social contribution.	

Table II.6.4. Goal orientations

Sub-scale	Item	Directions to respondent
Social goals of teachers	My main goal as a teacher is to show my students that I care about them.	On a scale of 1 (Totally disagree) to 7 (Totally agree), to what extent do you agree or disagree with the following statements?
	More than anything, I aspire to create deep personal relationships with each and every student.	
	As a teacher, building relationships with students is most important for me.	
	I would feel that I had a successful day in school if I saw that I was developing closer and better relationships with students in my classes.	

Table II.6.5. Teacher self-responsibility

Sub-scale	Item	Directions to respondent
Student motivation	…if a student of mine was not interested in the subject I teach.	On a scale of 1 (Not at all responsible) to 7 (Completely responsible,) I would feel PERSONALLY responsible if…
	…if a student of mine did not like the subject I teach.	
	…if a student of mine did not value learning the subject I teach.	
Student achievement	…if a student of mine failed to make excellent progress throughout the school year.	

	…if a student of mine failed to learn the required material.	
	…if a student of mine had very low achievement.	
Relationships with students	…if a student of mine thought he/she could not count on me when he/she needed help with something.	
	…if a student of mine did not think that he/she can trust me with his/her problems in or outside of school.	
	…if a student of mine did not believe that I truly cared about him/her.	
Quality of teaching	…if a lesson I taught was not as effective for student learning as I could have possibly made it.	
	…if a lesson I taught was not as engaging for students as I could have possibly made it.	
	…if a lesson I taught failed to reflect my highest ability as a teacher.	

Table II.6.6. Intrinsic orientations

Sub-scale	Item	Directions to respondent
Enthusiasm for teaching	I really enjoy teaching.	On a scale of 1 (Strongly disagree) to 7 (Strongly agree), to what extent do you agree or disagree with the following statements?
	I teach with great enthusiasm.	

Table II.6.7. Commitment to teaching

Sub-scale	Item	Directions to respondent
Planned persistence	How sure are you that you will persist in a teaching career?	On a scale from 1 (Not at all) to 7 (Extremely), please rate how much you agree with each statement below.
	How satisfied are you with your choice of becoming / being a teacher?	
Willingness to invest personal time	...to work with students?	On a scale of 1 (None) to 7 (Most of it), how much of your PERSONAL time are you willing to invest…
	...to improve your teaching?	
	...to help students?	
	...to communicate with parents?	
	...to prepare good lessons?	
Interest in professional development	…focus on subject-specific knowledge?	On a scale of 1 (Not at all) to 7 (Extremely), how important is it to you to participate in professional development activities that:
	…focus on pedagogical knowledge?	
	…focus on classroom management skills?	
	…focus on alternative teaching practices?	

ANNEX III – ITEL TEACHER KNOWLEDGE SURVEY INSTRUMENT

This Annex can be found at the following link:

www.oecd.org/edu/ceri/EDU_WKP(2017)8.pdf

ANNEX IV – VALIDATION OF THE PEDAGOGICAL KNOWLEDGE INSTRUMENT

This Annex can be found at the following link:

www.oecd.org/edu/ceri/EDU_WKP(2017)8.pdf

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